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Bulletin 428 August, 1939

CONNECTICUT STATE ENTOMOLOGIST
THIRTY-EIGHTH REPORT
1938

W. E. BRITTON, PH.D.
State Entomologist

Connecticut
Agricultural Experiment Station
New Haven

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WILTON EVERETT BRITTON

September 18, 1868—February 15, 1939
State Entomologist, July 1, 1901—February 15, 1939

CONNECTICUT STATE ENTOMOLOGIST

THIRTY-EIGHTH REPORT

1938

W. E. Britton

ENTOMOLOGICAL FEATURES OF 1938

In several respects the season of 1938 was unusual. Preceded by a fairly mild winter, low temperatures and snow were infrequent along the coast, although in certain inland areas much snow and several periods of sub-zero weather occurred. During seeding time the weather was cool and soil temperatures were too low for quick germination; seeds of corn, beans and peas were infested and destroyed by the seed corn maggot, *Hylemyia cilicrura* Rond. Many fields were re-planted even two or three times.

Perhaps the greatest divergence from the normal at the Mount Carmel farm was in precipitation during the growing months of May, June and July, when the rainfall was 19.09 inches or 8.5 inches above normal. The heavy rainfall of September increased the yearly precipitation to 58.16 inches at Mount Carmel, or 7.80 above normal, although the precipitation for the other eight months was below normal. The heaviest downpour occurred in September when in one storm, over a period of four days, from 10 to 18 inches fell in different localities of the State. This storm culminated September 21 in a hurricane that broke and uprooted hundreds of thousands and perhaps millions of trees, including many orchards. It also caused tremendous damage by blowing down or carrying away buildings and other structures and washing away the land, particularly along the coast.

Some insects were present in usual abundance, some more prevalent than usual and others less common.

Cutworms, cabbage worms, wireworms, the striped cucumber beetle (*Diabrotica vittata* Fabr.), the Mexican bean beetle (*Epilachna varivestris* Muls.), and the potato flea beetle (*Epitrix cucumeris* Harr.) were normally prevalent. The flea beetle commonly infested potato and tomato and severely damaged an acre of cucumber plants. Tobacco fields also were damaged to some extent.

The European corn borer, *Pyrausta nubilalis* Hübn., probably caused more damage to corn and dahlias than ever before in those sections of Connecticut where it is most prevalent. Also potato, aster and marigold were heavily infested. Even raspberry canes were infested in Kensington, and larvae were found in apple fruit at the Station farm at Mount Carmel, although no corn grew within 100 yards.

The Oriental fruit moth, *Grapholitha molesta* Busck, was perhaps twice as prevalent as in 1937. Both the European red mite, *Paratetranychus pilosus* C. &. F., and the peach borer, *Conopia exitiosa* Say, were unusually prevalent.

The armyworm, as in 1937, damaged grass and grain crops in Connecticut; oats and grass in Norwalk, Ellington, and at some 20 other places in Windham and Tolland counties. It also damaged corn in Branford, Mount Carmel and Orange, and lawns in Ridgefield. The fall armyworm, *Laphygma frugiperda* S. & F., ruined many ears of sweet corn in September at Mount Carmel.

The Japanese beetle, *Popillia japonica* Newm., continued to increase, particularly in those centers like Bridgeport, Hartford, New Haven, New London and Stamford, where it has been most prevalent.

The forest tent caterpillar, *Malacosoma disstria* Hübn., was unusually common in portions of Litchfield County, and completely or partially defoliated sugar maple trees in many parts of Goshen, Litchfield and West Cornwall.

An uncommon insect, one of the prominents, *Heterocampa manteo* Doubl., fed rather extensively on beech and oak in Killingworth and Litchfield, and there was an outbreak of the elm spanworm or snow-white linden moth, *Ennomos subsignarius* Hübn., in Monroe where about 250 acres were defoliated.

A large area of more than 1,000 acres, mostly in Granby, and a smaller area of about 100 acres, in Union, were stripped by the gypsy moth. These were discovered in July.

However, there were some insects less troublesome than in 1937, such as the onion thrips, *Thrips tabaci* Linde, the squash bug, *Anasa tristis* DeG., the corn ear worm, *Heliothis obsoleta* Fabr., and the white apple leafhopper, *Typhlocyba pomaria* McAtee.

The tent caterpillar, *Malacosoma americana* Fabr., was scarce although in Rainbow, Windsor, the nests were common on birch and oak as well as on wild cherry, and the caterpillars had attempted to eat pine needles. The insect was said to be more prevalent in Litchfield County than in most other parts of the State.

The fall webworm, *Hyphantria cunea* Dru., which has been scarce for several years, was somewhat more prevalent in Fairfield County than elsewhere.

During the season a pair of the European earwig, *Forficula auricularia* Linn., was found in the western portion of New Haven. This seems to be the first record for Connecticut.

Meadow mice (*Microtus pennsylvanicus pennsylvanicus* Ord) and pine mice (*Pitymys pinetorum scalopsoides* A. and B.) have injured orchard, nursery, and young forest trees, in many cases extensively, throughout the State. The mouse problem is discussed elsewhere in this report.

Some of the more important insects will be more fully discussed in articles and notes in the following pages. The insect record for 1938 follows:

INSECT RECORD FOR 1938

Fruit Insects

Name — Locality, host, date and remarks

Agrilus ruficollis, red-necked cane borer. Galls on raspberry canes, Southington, Nov. 23, 1937; Shelton, March 11.

Alypia octomaculata, eight-spotted forester. Larva on grape, Bantam, June 17.

Anuraphis roseus, rosy apple aphid. Severe damage in some localities. Eggs on apple trees, New Hartford, Jan. 3; nymphs, Hamden, May 31, June 1, 6; aphids, New Haven, June 7, 9, 16, 23, 24; Middletown, June 15; New Britain, June 17; damaged apples, Glenbrook, Aug. 3; East Haven, Sept. 7.

Aphis pomi, green apple aphid. On apple, New Haven, June 7; New Britain, June 17.

Aspidiotus perniciosus, San José scale. Pear twigs heavily infested, Old Lyme, May 14.

Cacoecia argyrospila, fruit tree leaf roller. Not prominent. On apple, Norwalk, June 23.

Carpocapsa pomonella, codling moth. Not very prevalent in 1938. Damaged fruit, Bristol, Sept. 17.

Cedidomyia sp. Petiole galls on grapevine, New Britain, Jan. 27.

Conopia exitiosa, peach borer. Rather prevalent. Severe damage to peach nursery stock, Ellington.

Conotrachelus juglandis, walnut curculio. Damaged walnut twigs, Storrs, May 5.

Conotrachelus nenuphar, plum curculio. Apples with characteristic scars, Woodbridge, Dec. 1, 1937; South Norwalk, June 25; East Haven, Sept. 7.

Contarinia pyrivora, pear midge. Maggots in pear fruit, Pawcatuck, June 15.

Datana ministra, yellow-necked caterpillar. Unusually prevalent. Larvae on apple, Greenwich, July 29; Canton Center, Aug. 3; Hamden, Aug. 17; Seymour, Aug. 19; Waterford, Aug. 20; Woodbridge, Aug. 22; Mystic, Aug. 23; damaged apple tree, Old Lyme.

Eriophyes pyri, pear leaf blister mite. On pear, Ohio, July 12.

Grapholitha molesta, Oriental fruit moth. Twice as destructive as in 1937. Damaged peach twigs, Portland, Aug. 25.

Janus integer, currant stem girdler. Damaged currant stem, Hamden, June 6.

Lagoa crispata, crinkled flannel moth. Caterpillars, New Canaan, Aug. 27; Hamden, Aug. 31.

Lasioptera vitis, tomato grapevine gall. Galls on grapevine, New Haven, June 16; Bantam, June 17.

Leafhopper on plum. Damaged plum leaves, Westport, Aug. 11.

Macrodactylus subspinosus, rose chafer. Abundant in certain localities. Damaged apple and peach trees, Milford, June 14.

Monophadnoides rubi, raspberry sawfly. Damaged raspberry leaves, Bantam, Aug. 5.

Myzus cerasi, black cherry aphid. On cherry, New Haven, June 10.

Oxyptilus periscelidactylus, grape plume moth. Larva, June 17.

Paratetranychus pilosus, European red mite. Eggs on apple tree, New Hartford, Jan. 3; mites on plum leaves, Westport, Aug. 11.

Phobetron pithecium, hag moth. More prevalent than usual. Larva on apricot, Stratford, Aug. 23.

Phylloxera vitifoliae, grape phylloxera. Galls on grape leaves, New Haven, June 18; Bristol, Aug. 24; Shelton, Aug. 25.

Polychrosis viteana, grape berry moth. Larvae in grape berries, Warehouse Point, July 21.

Fruit Insects—*Continued*

Name — Locality, host, date and remarks

Popillia japonica, Japanese beetle. Adults on grapevine, New Haven, July 25, Aug. 2.

Prionus laticollis, broad-necked root borer. Larva in base of pear tree, Woodbridge, Dec. 1, 1937.

Prolimacodes scapha, a slug caterpillar devouring cherry foliage, Hamden, Sept. 19.

Pyrausta nubilalis, European corn borer. Larvae in apple fruit, Wallingford, July 26; Mount Carmel, Oct. 1; in raspberry canes, Kensington, Sept. 10.

Reticulitermes flavipes, termite. In apples on ground, Hamden, Oct. 5.

Rhagoletis pomonella, apple maggot. Infested apple fruit, East Haven, Sept. 7; Bristol, Sept. 17.

Samia cecropia, cecropia moth. Cocoon on apple tree, Farmington, Feb. 26.

Saperda candida, round-headed apple tree borer. Gallery in apple tree, Meriden, May 4.

Schizura concinna, red-humped caterpillar. Larvae on plum, Hamden, Aug. 5; parasitized cocoons on apple, Pleasant Valley, Sept. 7; abundant in southern Connecticut.

Scolytus rugulosus, shot-hole borer. Adult beetles in cherry, New Haven, Aug. 17.

Sibine stimulea, saddle-back caterpillar. Larvae on plum, Naugatuck, Aug. 18.

Stelidota geminata, a sap beetle. Adults damaged strawberries, Wethersfield, June 24.

Tetranychus bimaculatus (*telarius*), common red spider. Damaged strawberry plants, Branford, May 21.

Vegetable Insects

Acrosternum hilare, green stink bug. Nymphs on lima beans, North Haven, Sept. 6; nymphs on beans, Orange, Sept. 15.

Agrioles mancus, wheat wireworms. Larva in planted kernel of seed corn, Torrington, May 25.

Bourletiella (*Sminthurus*) *hortensis*, garden springtail. Damaged spinach leaves, Hamden, May 11; on cucumber seedlings, Southington, May 24.

Ceutorhynchus sp. Damaged radish, Hyannis, Mass., June 13.

Cirphis unipuncta, armyworm. About as prevalent as in 1937, and caused considerable damage to oats and grass in Norwalk, Ellington and some 20 other places in Tolland and Windham counties. Larvae on corn, Orange, June 24; on oats and grass, Norwalk, July 5; Ellington, July 11; on corn, Mount Carmel, North Branford, Aug. 9.

Deloyala clavata, clavate tortoise beetle. Adults on potato, Southport, July 12.

Dipterous maggots in mushroom, New Canaan, Sept. 20.

Epicauta marginata, margined blister beetle. Adults feeding on tomato, New Haven, July 29; East Haven, July 30; on mangel beets, Stonington, Aug. 2.

Epilachna varivestis (*corrupta*), Mexican bean beetle. Present in usual numbers and caused the usual amount of damage. Damaged bean leaf, Hamden, June 16; on lima beans, Plantsville, Aug. 12.

Epitrix cucumeris, potato flea beetle. Abundant and caused severe damage to tobacco plants late in May, and to potato and tomato in July.

Frankliniella fusca, tobacco thrips. Very prevalent in tobacco fields in June.

Hylemyia cilicrura, seed corn maggot. Damaged newly set tobacco plants in Hartford County in June. After third setting it disappeared.

Laphygma frugiperda, fall armyworm. Larvae caused considerable damage to corn at Mount Carmel in September.

Vegetable Insects—*Continued*

Name — Locality, host, date and remarks

Leptinotarsa decemlineata, Colorado potato beetle. Present in usual numbers. Adult on lawn, New Haven, April 29.

Limonius agonus, a click beetle whose larva is a wireworm. Larvae damaged potato and radish in Hartford County, May 17, according to A. W. Morrill, Jr.

Lygus pratensis, tarnished plant bug. Damaged tobacco, leaves badly misshapen, Collinsville, July 5, according to A. W. Morrill, Jr.

Melanotus communis, a click beetle. Adult in house, Plainfield, April 25.

Melanotus sp., a click beetle. Larva a wireworm. Middletown, Nov. 30, 1937.

Melittia satyriniformis squash borer. Damaged squash vines, Mount Carmel, July 25. Abundant in other parts of Connecticut.

Millipedes (unidentified) in garden, Hamden, June 17.

Papaipema nitela, stalk borer. Larva, Newington, July 1; in bean, Woodbridge, July 19.

Pegomyia hyoscyami, spinach leaf miner. More common than for several years. Mines in beet and Swiss chard, New Haven, July 6; adults around cottages, West Hartford, July 16.

Pill bug (unidentified), a small crustacean. In garden, New Haven, April 22; Hamden, June 17.

Protoparce (Phlegethontius) quinquemaculata, tobacco worm. Adult, New Milford, Aug. 29; pupa, Bristol, Oct. 24.

Pyrausta nubilalis, European corn borer. Very abundant and caused severe damage in the sweet corn producing regions. Larva in bean, Woodbridge, July 19; pupae in potato stalks, Forestville, July 22; pupa skins in potato and tomato stalks, Pequabuck, Aug. 6; larva in jar of sour cream, New Haven, Sept. 3.

Reticulitermes flavipes, termite. Damaged rhubarb stems, New Haven, July 22.

Rhizoglyphus hyacinthi, bulb mite. Damaged onion bulbs, Milford, July 7.

Sibine stimulea, saddle-back caterpillar. Larvae feeding on corn, Clinton, Sept. 12.

Thrips (immature) on pea pods, Clinton, July 19.

Wireworms (unidentified) in garden, New Haven, April 22.

Forest and Shade Tree Insects

Acrobasis caryae, pecan nut case bearer. Larva on black walnut, Meriden, May 26.

Adelges abietis, spruce gall aphid. Seventeen lots from 10 different localities. Galls on Norway spruce, Riverside, March 15; Hamden, March 24; West Hartford, April 4; Waterbury, April 19, 20, May 10, June 2, July 20, Sept. 12; Bridgeport, April 28, June 24; Guilford, May 18; Plantsville, May 26; East Haven, June 2; New Britain, June 6, July 15; Plainville, June 23.

Adelges cooleyi, blue spruce gall aphid. Galls on blue spruce, New Haven, July 3; Stratford, July 11.

Adelges cooleyi var. *coweni*, woolly aphids not forming galls on Douglas fir, Torrington, June 15; Clinton, June 15; Stratford, July 3.

Agrilus anxius, bronzed birch borer. Reported as abundant in white birch, Fairfield, June 21, by Dr. E. P. Felt.

Ancylis platanana, a leaf folder of sycamore. Unusually abundant, some trees having 50 percent of their leaves webbed and eaten. Damaged leaves, New Canaan, Aug. 2.

Andricus punctata, gouty oak gall. Galls on oak, New Milford, May 18; abundant at Ridgefield, Feb. 25, according to Dr. E. P. Felt.

Forest and Shade Tree Insects—*Continued*

Name	Locality, host, date and remarks

Anisota senatoria, orange-striped oak worm. Unusually prevalent. Adult, Scotland, June 6; larvae, North Haven, Aug. 23; Hamden, Aug. 31; larvae stripped oak trees, Bethel, Sept. 2; Niantic, Sept. 7; Essex, Sept. 7.

Aphids, cast skins on tulip tree, Trumbull, July 21; young aphids on chestnut, Mount Carmel, July 29; on spruce, Bar Harbor, Me., Aug. 9; on oak, Salisbury, July 12; on maple, Manchester, Aug. 25; on pin oak, Guilford, Sept. 1; aphid damage to white pine, South Windsor, March 30; New Canaan, July 1.

Aphrophora parallela, a pine spittle bug. Abundant in certain plantations of red pine and white pine, according to Dr. E. P. Felt. Nymphs in pine, Hartford, June 16.

Argyresthia thuiella, arborvitae leaf miner. Twigs with mined leaves, Bridgeport, March 28; Hamden, (2 samples) April 29, June 14; New Haven, May 26; Meriden, July 15.

Argyrotaenia pinatubana, pine tube moth. Somewhat abundant, Darien, according to Dr. E. P. Felt.

Aspidiotus perniciosus, San José scale. On mountain ash, Hamden, Aug. 8.

Basilona imperialis, emperor moth. Larva on pine, New Haven, Sept. 3; larva under maple tree, Orange, Sept. 12.

Battaristis vittella, a shoot moth damaging buds and shoots of red and mugho pines. Widespread in Connecticut, May 23.

Cacoecia cerasivorana, ugly-nest caterpillar. Larvae on cherry, Goshen, June 16.

Cacoecia fumiferana, spruce budworm. Damaged spruce twig, Stonington, June 23.

Caulacampus (Priophorus) acericaulis, maple leaf stem borer. Damaged sugar maple leaves, Cos Cob, June 10; Canaan, June 10.

Cecidomyid galls on poplar, Bethel, Aug. 16.

Cerastipsocus venosus, a Corrodentid insect that clusters on the bark of trees. Adults, Canton Center, Aug. 3; Norfolk, Aug. 19; Keene, N. H., Aug. 19.

Chionaspis pinifoliae, pine leaf scale. Common throughout the State on certain species of pine. On mugho pines, Waterbury, April 20, Sept. 17; Hamden, April 27; Hartford, June 10, 11; Norfolk, Aug. 10.

Chrysobothris sp. Crushed larva in maple, Hartford, March 28.

Cimbex americana, elm sawfly. Larvae on willow, Rockville, July 23.

Coleophora laricella, larch case bearer. Damaged larch trees, Norwalk, May 18.

Coleophora limosipennella, elm case bearer. Mines in elm leaves, Meriden, Oct. 14.

Conotrachelus anaglypticus, a weevil. Adults on willow, Northford, July 7.

Corythucha ciliata, sycamore lacebug. Unusually prevalent. New Britain, Aug. 20.

Corythucha marmorata, oak lacebug. Adults on leaves, Granby, July 12.

Corythucha ulmi, elm lacebug. Very prevalent in western portion of the State.

Dasyneura communis, gouty-vein midge. Galls on sugar maple, West Hartford, May 17; Collinsville, May 24; New Milford, May 26; Manchester, June 4; Plainville, June 7; Torrington, June 7; Simsbury, (2 lots) June 20; Windsor, June 23.

Dasyneura ulmea, a twig gall on elm. Galls, South Meriden, Feb. 17; Millbrook, N.Y., March 3.

Datana contracta, a Notodontid moth. Reported by J. V. Schaffner, Jr., as being partly responsible for woodland defoliation, Sept. 23.

Datana integerrima, walnut caterpillar. Abundant in black walnut, butternut and occasionally on hickory, particularly in the southwestern portion of the State.

Forest and Shade Tree Insects—*Continued*

Name	Locality, host, date and remarks

Defoliated trees in New Haven and Windsor. Larvae on walnut, New Haven, Aug. 5; on black walnut, Woodbridge, Aug. 22; Avon, Sept. 14.

Datana ministra, yellow-necked caterpillar. Unusually abundant and, though it commonly feeds on apple, in 1938 it was prevalent on various woodland trees. Very abundant in New Haven, Seymour, Canton, Greenwich and Windsor, and also stripped the smaller oaks in Windsor in August, according to the observations of G. H. Plumb. Larvae on pin oak, New Haven, Aug. 3; on maple, Hamden, Aug. 31; on oak, North Haven, Aug. 30, Sept. 7; Niantic, Sept. 7.

Diabrotica duodecimpunctata, spotted cucumber beetle. On white pine, Middletown, Oct. 28.

Diaspis carueli, juniper scale. On juniper, New Haven, June 28.

Dilachnus sp., probably *strobi*, an aphid. Eggs on white pine, West Hartford, April 4; Middletown, Oct. 28.

Dryophanta palustris, succulent oak gall. Galls on oak leaves, New Haven, New Britain, May 26.

Ectoedemia populella, a leaf gall on poplar. Galls on poplar leaves, South Meriden, Sept. 27.

Ennomos subsignarius, elm spanworm. Defoliated 250 acres of woodland on low ground in Monroe, in June.

Eriophyes sp., erineum or galls caused by mites. Bud galls on birch, South Meriden, Feb. 23; erineum on beech leaves, Darien, May 18; Westport, May 31; on ash, Winsted, May 31; on elm, Greenwich, May 20; on birch, Hamden, June 3; on poplar, Haddam, June 8; on elm, Norwalk, June 23; Hartford, June 24; Millbrook, N. Y., July 7.

Eriosoma americanum, woolly elm aphid. On elm, Torrington, June 16.

Erythraspides caryae, woolly hickory sawfly. Larvae on walnut, Canaan, Aug. 9.

Fenusa pumila, leaf mining birch sawfly. On European white birch, Hamden, May 25; on gray and white birch, North Haven, July 14; on gray birch, Norwalk, Aug. 5.

Galerucella luteola, elm leaf beetle. Caused rather severe damage in southern Litchfield and western Fairfield counties. Adults in house, Bridgeport, Nov. 5, 1937; Hartford, Nov. 12, 1937; East Hartford, Nov. 13, 1937, April 26, May 13, July 22; New Britain, Dec. 8, 1937; Maine, Dec. 21, 1937; Plantsville, April 22; Vernon Center, May 6; Plainfield, May 31; damaged leaves, Waterbury, July 28.

Galleries in maple bark, West Hartford, May 10.

Glycobius speciosus, sugar maple borer. Adults, North Haven, July 14; Litchfield, Aug. 15; Meriden, Aug. 15.

Gossyparia spuria, elm scale. On Siberian elm, Hamden, June 20.

Halisidota caryae, hickory tussock moth. Unusually prevalent. Larvae on beech, Wallingford, July 15; on hickory, Weston, Aug. 5; Watertown, Aug. 9; larvae, New Haven, Aug. 19; Essex, Sept. 7.

Halisidota tessellaris, spotted tussock moth. Very prevalent on trees in woodlands. Larva on cut-leaf maple, Manchester, Aug. 10; larva, Avon, Sept. 14.

Haltica ulmi, green elm beetle. Damaged elm leaves and larval skins, South Meriden, Oct. 14; adults, Norfolk, Oct. 19.

Hamadryas (*Euvanessa*) *antiopa*, spiny elm caterpillar. Larvae on elm, Hamden, June 14.

Hemerocampa leucostigma, white-marked tussock moth. Egg-mass and old cocoon on elm, Wilton, Jan. 31; egg-mass on maple, Southbury, March 21.

Heterocampa manteo, a prominent or Notodontid moth. Caterpillars abundant on oak and beech, Killingworth and Litchfield, Sept. 6.

Forest and Shade Tree Insects—*Continued*

Name	Locality, host, date and remarks

Hylobius pales, pales weevil. Damaged white pine twig, South Windsor, March 30.

Hypermallus villosus, twig pruner. Larva in oak, Lakeville, July 12.

Hyphantria cunea, fall webworm. Larvae on mountain ash, New Haven, July 5; larva, Avon, Sept. 14. Dr. E. P. Felt reports this insect as rather prevalent around Stamford.

Lasioptera clavula, dogwood club gall. Galls on flowering dogwood, Guilford, May 24.

Leafhoppers, cast skins on oak, New Haven, July 28; damaged maple leaves, Manchester, Aug. 5.

Leaf roller on willow, Meriden, May 26.

Lecanium fletcheri, arborvitae soft scale. Infested twigs, Addison, May 26; Meriden, June 15; New Haven, June 16, (2 lots) June 28.

Lepidopterous larvae, on purple beech, New Haven, June 3; on maple, Gaylordsville, Sept. 2.

Lepidosaphes ulmi, oyster-shell scale. Locally abundant in Woodstock and in southwestern Connecticut, according to Dr. E. P. Felt. On willow, New Haven, July 25.

Macremphytus varianus, a dogwood sawfly. Unusually prevalent. Larvae on Cornus or dogwood, Wilton, Aug. 5; Weston, Aug. 5; Thompsonville, Aug. 8; Meriden, Aug. 15; Waterford, Aug. 20; Wallingford, Aug. 23; New Milford, Aug. 24.

Macremphytus sp. Larvae, Plainville, Aug. 10.

Macrodactylus subspinosus, rose chafer. Abundant locally and fed heavily on elms in Branford, North Haven and Wallingford. Adults feeding on birch, maple and oak, Groton, June 10.

Malacosoma americana, tent caterpillar. Scarce around New Haven, but more abundant in Litchfield and Tolland counties and at Rainbow in Hartford County, May 21; cocoon on pine, Ansonia, Sept. 8.

Malacosoma disstria, forest tent caterpillar. Locally very abundant. Defoliated large numbers of maple and oak in Cornwall, Goshen and Litchfield. Caterpillars, New Haven, May 10; on oak, Goshen, June 16; pupa skins on oak, Salisbury, July 12.

Matsucoccus sp., a scale on pine. No winter mortality in Connecticut, according to T. J. Parr, who is studying this insect.

Melanotus pertinax, a click beetle. Adults on maple tree, New Hartford, May 26.

Melanoxantherium smithiae, a purplish twig aphid. On willow, Deep River, Sept. 21.

Needle miner in spruce. Bar Harbor, Me., Aug. 9.

Neodiprion lecontei, red-headed pine sawfly. Larvae, Bethel, Aug. 16.

Neodiprion pinetum, black-headed pine sawfly, formerly known as Abbott's sawfly. Larvae on white pine, Bethany, July 16; New Haven, Aug. 15; Avon, Sept. 14; Westport, Oct. 3. Prevalent around Danbury, July 22, according to Dr. E. P. Felt.

Neoprociphilus aceris, a woolly aphid. Infesting sugar maple, New Haven, June 10; Bridgeport, June 16.

Nepticula sericopeza, a borer in the seeds and leaf stems of Norway maple. Damaged leaves, East Haven, June 13.

Neuroterus noxiosus, noxious oak gall. Galls on oak, Stamford, March 31; New Rochelle, N. Y., May 31.

Neuroterus umbilicatus, oak button gall. Galls on oak leaves, Darien, June 25.

Olene achatina, a tussock moth. Larvae skeletonized red, white and black oak around Danbury and Stamford, according to Dr. E. P. Felt.

Pachypsylla celtidis-mamma, hackberry nipple gall. Galls on hackberry, South Manchester, Aug. 28; Chester, Sept. 1.

Forest and Shade Tree Insects—*Continued*

Name	Locality, host, date and remarks

Pachypsylla celtidis-vesiculum, hackberry blister gall. South Manchester, Aug. 26.

Parandra brunnea, parandra borer. In honey locust, Somers, Aug. 2.

Paratetranychus bicolor, oak mite. On oak, New Britain, June 28; on chestnut, Mount Carmel, July 29.

Paratetranychus ununguis, spruce mite. Very prevalent; 22 lots of specimens received from 18 localities. On spruce, Manchester, June 18; Derby, June 21; Orange, June 24; Plantsville, June 30; Vernon, July 6; Shelton, July 7; Westport, Aug. 11; Wethersfield, Sept. 10. On blue spruce, Meriden, June 15; Hartford, Aug. 3; Middletown, Aug. 18. On hemlock, Norwalk, June 23; Watertown, June 28; New Haven, July 7; Northford, July 7. On arborvitae, Hamden, June 23; New Haven, June 28, Aug. 10; Southport, July 22. On juniper, Rockville, May 17; New Haven, June 28; Hamden, June 28.

Pemphigus populicaulis, poplar basal leaf gall. Galls on poplar, Hamden, July 12.

Phenacoccus acericola, woolly maple leaf scale. Bark with overwintering female, Wethersfield, Feb. 10. Infested leaves, Middletown, Aug. 8; Hamden, Aug. 11.

Phobetron pithecium, hag moth. More prevalent than most seasons. Larvae, on silver maple, Stratford, Aug. 4; on maple, Bridgeport, Aug. 29; East Hartford, Aug. 31; pupae, Hartford, Aug. 18; Cheshire, Aug. 29.

Phyllocoptes aceris-crumena, maple spindle gall. Galls on sugar maple, West Cornwall, June 15; Norwalk, June 23.

Phyllocoptes quadripes, maple bladder gall. Galls on silver maple leaves received from 15 localities. Hamden, May 17; New Haven, May 18; Manchester, May 19; Stamford, May 20; New London, May 23; Waterbury, May 24; New Canaan, May 27; North Woodbury, June 3; Clinton, June 6; Branford, June 17; Fairfield, June 22; Southington, June 25; Jewett City, July 9; Forestville, July 25; Collinsville, Sept. 7.

Phyllophaga tristis, a small June beetle. Defoliated oaks in Middlebury, according to Dr. E. P. Felt.

Phylloxera caryaecaulis, hickory stem gall aphid. Galls on hickory stems, Branford, May 26; Yalesville, June 1; West Hartford, June 6.

Pineus floccus, a bark aphid. On red spruce, Norfolk, June 1.

Pineus strobi, pine bark aphid. Somewhat abundant at Lakeville, June 21, according to Dr. E. P. Felt. On white pine, New Haven, July 25.

Pissodes strobi, white pine weevil. Damaged white pine, Wilton, June 24; South Kent, July 21; in spruce, East Hampton, July 25; in mugho pine, Salisbury, Aug. 12, and Hamden, Sept. 2.

Plagiodera versicolora, imported willow leaf beetle. Adults under willow bark, Windsor Locks, Jan. 3; on willow, Meriden, May 25; West Haven, July 27; Waterbury, July 28.

Popillia japonica, Japanese beetle. Damaged mountain ash leaves, Bridgeport, July 15.

Porthetria dispar, gypsy moth. Defoliated hundreds of acres of woodland in Granby, Simsbury and Union. Young larvae on clothing of person who had just arrived from Orono, Me., May 16.

Prionus laticollis, broad-necked root borer. Larva, South Woodstock, April 9.

Prociphilus tessellatus, woolly alder aphid. On silver maple, Jewett City, July 9. Prevalent around Hartford, July 22, according to Dr. E. P. Felt.

Psocids (unidentified). Adults on bark of trees, New Haven, Aug. 1. Abundant in unfinished attic of shore cottage, Money Island, off Stony Creek, according to Dr. E. A. Back.

Psyllopsis fraxinicola, an ash psyllid. Damaged ash foliage, Greenwich, July 22, according to Dr. E. P. Felt.

Pulvinaria acericola, a maple scale. On dogwood, New Haven, June 22.

Forest and Shade Tree Insects—*Concluded*

Name — Locality, host, date and remarks

Rhyacionia buoliana, European pine shoot moth. Damaged pine shoots, Westport, May 18; on red pine, Red Bank, N. J., May 23; West Haven, June 14; Hartford, June 16; Stonington, June 23; on mugho pine, Hamden, Sept. 2; on Austrian pine, Greenwich, Sept. 23.

Samia cecropia, cecropia moth. Larva on silver maple, Hamden, Aug. 18, 31.

Schizura concinna, red-humped caterpillar. Larvae on dogwood, Hartford, Aug. 30.

Scolytid beetle in juniper twig, West Hartford, June 27; damage to mugho pine, Litchfield, April 4.

Spilosoma virginica, virgin tiger moth. Larvae on sycamore, Wallingford, Aug. 26.

Stilpnotia salicis, satin moth. Larvae on poplar, Vernon, June 15; adults in large numbers swarmed around electric lights, Torrington, June 25, according to S. S. Crossman.

Symmerista albifrons, one of the Notodontid moths or prominents. Involved in partial defoliations of woodlands, according to J. V. Schaffner, Jr.

Telea polyphemus, polyphemus moth. Larva on oak, New Haven, Aug. 22.

Tetralopha robustella, a Pyralid moth. Larva makes frass balls on various species of pine. Frass ball with dead larvae on red pine, New Britain, Feb. 16; frass balls on pine, Waterbury, May 23; Plainville, Oct. 17.

Tetralopha sp. Larvae feeding on oak leaves in squirrel's nest, West Suffield, Feb. 16.

Thrips (immature). Nymphs under bark of mugho pine, Litchfield, April 4.

Thyridopteryx ephemeraeformis, bagworm. Larvae on maple, West Haven, Aug. 4.

Toumeyella liriodendri, tulip tree scale. On tulip tree, Wethersfield, July 19.

Insects of Shrubs and Vines

Basilarchia arthemis, banded purple butterfly. Larva on flowering crab, New Haven, July 20.

Brachyrhinus sulcatus, black vine weevil. Grubs damaged Taxus plants, Wallingford, March 29; pupae in soil about Taxus plants, Hamden, May 11.

Calligrapha philadelphica, a leaf beetle. Adult on red-twig dogwood, Hartford, Aug. 30.

Chionaspis euonymi, euonymus scale. Infested euonymus leaves and twigs, many eggs present, New Haven, Nov. 15, 1937; Westport, Oct. 11.

Coccus hesperidum, soft scale. On leaves of English ivy, Westport, Aug. 11.

Dendrothrips ornatus, a thrips. On privet, Bridgeport, Aug. 3; reported from Stamford, Aug. 23, by Dr. E. P. Felt.

Dialeurodes chittendeni, a rhododendron whitefly. Somewhat abundant on rhododendron, Greenwich, April 23, according to Dr. E. P. Felt. The first record for Connecticut.

Diaspis carueli, juniper scale. On Pfitzer juniper, Hartford, Sept. 17.

Dichomeris marginellus, juniper webworm. Webbed twigs and dead larvae, Norwalk, May 18; webbed twigs, Hamden, June 28.

Epargyreus tityrus, silver-spotted skipper. Larvae, on wisteria, New Haven, July 25; North Haven, Aug. 9; Hamden, Aug. 11.

Eriococcus azaleae, azalea scale. Prevalent on rhododendron, Hartford, April 23, according to Dr. E. P. Felt.

Gracilaria syringella, lilac leaf miner. Larvae in mined lilac leaves, Branford, July 18.

Grasshoppers. Damaged rhododendron leaves, New Preston, June 27.

Hamamelistes spinosa, spiny witch-hazel gall. Galls on witch-hazel leaves, Essex, Aug. 6.

Insects of Shrubs and Vines—*Continued*

Name — Locality, host, date and remarks

Hormaphis hamamelidis, witch-hazel cone gall. Galls on witch-hazel leaves, Essex, Aug. 6.

Hyphantria cunea, fall webworm. Larvae and web on cultivated blueberry, Killingly, July 16.

Lepidosaphes ulmi, oyster-shell scale. Infested lilac, Rockville, May 31; New Haven, July 25.

Liosomaphis berberidis, an aphid, probably this species, on Japanese barberry, New Haven, June 24.

Macrodactylus subspinosus, rose chafer. Adults on hydrangea, Groton, June 10.

Mite damage on privet, Old Lyme, July 15.

Monarthropalpus buxi, boxwood leaf miner. Damaged boxwood leaves, Saugatuck, Aug. 30.

Neotetranychus buxi, a mite on boxwood. West Hartford, June 25.

Ormenis pruinosa, mealy flata, a lantern fly. Eggs in alder bark, South Meriden, Feb. 28.

Ormenis septentrionalis, a lantern fly. Adults, South Norwalk, Aug. 26; Woodbridge, Sept. 14.

Orthoptera (?). Holes eaten in rhododendron leaves, Bridgeport, April 6; New Britain, May 12.

Papaipema nitela, stalk borer. Larva in climbing rose, New Haven, June 30.

Pelidnota punctata, spotted grapevine beetle. Adults, Branford, Aug. 16.

Pemphigus rhois, red pouch gall. Galls on smooth sumac, Bantam, Aug. 27.

Phytomyza ilicicola, holly leaf miner. Mines in holly leaves, Bridgeport, April 28, May 2; Westport, July 12.

Popillia japonica, Japanese beetle. Adults, from vine on building, New Haven, July 19; on grapevine, New Haven, July 25, Aug. 2.

Pseudocneorrhinus setosus, a weevil from Japan. Adults feeding on mountain laurel, New Haven, June 15.

Pseudococcus cuspidatae, a mealybug on Taxus, Patchogue, N. Y., July 8; New Canaan, Sept. 21.

Sphecodina abbotii, abbot sphinx. Larvae, Shelton, July 22; on Boston ivy, Sharon, July 28.

Stephanitis rhododendri, rhododendron lacebug. Damaged rhododendron leaves, New Canaan, March 22; Milford, March 25; New Preston, June 27; on mountain laurel, Danbury, July 21; on rhododendron, Greenwich, Aug. 19; Watertown, Oct. 26; eggs, Derby, May 25.

Tetraleurodes mori var. *maculata*, mulberry whitefly. Pupa skins on mountain laurel, New Haven, April 21, June 13.

Tetranychus sp. Mite eggs on rhododendron, Bridgeport, April 6.

Vespa crabro, giant hornet. Girdled lilac twig, New Haven, July 12.

Insects of Flowers and Greenhouse Plants

Anomala orientalis, Asiatic beetle. Adults on roses, New Haven, July 14.

Apatela oblinita (?), a tiger moth. Larva on greenhouse plants, Springfield, Ohio, June.

Aphid (unidentified) in flower garden, Roxbury, June 8.

Autoserica castanea, Asiatic garden beetle. Adults in flower garden, New Haven, July 21, 22, 26; Norwalk, July 25; on zinnia, Old Greenwich, July 26.

Brachyrhinus sulcatus, black vine weevil. Grubs damaged cyclamen plants in greenhouse, Litchfield, Nov. 23, 1937; pupa, Middletown, May 27.

Insects of Flowers and Greenhouse Plants—*Continued*

Name — Locality, host, date and remarks

Bulb fly (unidentified). Maggots in lily bulbs, Plainville, Aug. 25.

Calomycterus setarius, a weevil from Japan. Adults in greenhouse, Westport, July 25; adults in house, Salisbury, Aug. 3.

Epicauta marginata, margined blister beetle. Adults on cornflower, New Haven, July 25; blister beetle damage on gladiolus, Waterbury, Aug. 29.

Euphoria inda, bumble flower beetle. Adult, East Hartford, Aug. 31.

Forda olivacea (?), a root aphid. On bachelor's button, Shelton, July 7.

Forficula auricularia, European earwig. Immature female, New Haven, June; adult male from same garden in October. First records for Connecticut.

Glischrochilus fasciatus, a sap beetle. Adults in gallery of European corn borer in dahlia, New Haven, July 9.

Hollyhock leaves eaten, New Britain, May 12.

Leaf miner (unidentified) in leaves of *Polygonum auberti*, Thompsonville, Sept. 17.

Leaf roller (unidentified), rolled rose leaf and crushed larva, Wallingford, May 20.

Lepidopterous larva (unidentified) on cactus, Hartford, March 16; other kinds in garden, Noroton, July 1; on zinnia, Waterbury, Sept. 3.

Macrodactylus subspinosus, rose chafer. Adults, in flower garden, Roxbury, June 8; damaged roses and peonies, Hamden, June 13; Norwalk, June 27.

Meloe angusticollis, a blister beetle. Adults on clematis, Hartford, Sept. 28.

Mononychus vulpeculus, an iris weevil. Adults, in flower garden, Roxbury, June 8; on iris, Thompsonville, June 10; Woodbridge, June 16.

Pachystethus lucicola, light-loving grapevine beetle. Adult on dahlia, Hamden, July 24.

Phyllophaga gracilis, a small June beetle. Adult in flower garden, July 21.

Poecilocapsus lineatus, four-lined plant bug. Unusually prevalent. Damaged leaves of pansy, peony and plantain lily, West Haven, June 10; on phlox, Hamden, June 17; on chrysanthemum, New Haven, June 23, 24; Collinsville, June 27; Bristol, July 7.

Popillia japonica, Japanese beetle. Adults on flower garden plants, New Haven, July 9, 12, 13, 22; Hamden, July 11; on roses, New Haven, July 11, 28, Aug. 25; Hamden, July 24; Wallingford, Aug. 22; on dahlia, New Haven, July 11; on rose and zinnia, Milford, July 29; on mallow, Meriden, Aug. 17.

Pseudococcus sp., a mealybug. On fuchsia, Westport, Aug. 11.

Pyrausta nubilalis, European corn borer. Very destructive to dahlias. In dahlia, New Haven, July 9; Wallingford, Aug. 19; in zinnia, New Haven, July 28.

Reticulitermes flavipes, termite. Damaged chrysanthemum plants, Bristol, Aug. 5.

Rhizoglyphus hyacinthi, bulb mite. Damaged lily bulbs, Plainville, Aug. 25.

Saissetia hemisphaerica, hemispherical scale. On fern, New Haven, April 27.

Sibine stimulea, saddle-back caterpillar. Unusually prevalent. Larva on gladiolus, Stony Creek, Aug. 19; Hamden, Aug. 27; on regal lily, New Britain, Aug. 22; on sweet peas, Hamden, Aug. 27; on peony, New Haven, Sept. 1; on iris, Clinton, Sept. 8; larva without mention of food plant, Newtown, Sept. 8.

Springtails (unidentified) in soil in pot of fern in house, Hamden, Feb. 19.

Taeniothrips simplex, gladiolus thrips. Damaged gladiolus plants, Hamden, Aug. 1; Waterbury, Aug. 29.

Tarsonemus pallidus, cyclamen mite. Infested heliotrope and Impatiens, Norwalk, Jan. 31; on chrysanthemum, Montowese, Sept. 3.

Tetraleurodes mori, mulberry whitefly. Pupa skins on holly, Rye, N. Y., May 26.

Insects of Flowers and Greenhouse Plants—*Concluded*

Name — Locality, host, date and remarks

Tetranychus bimaculatus, red spider. On violet, Granby, July 12; on phlox, Middletown, July 20.

Thrips (unidentified). Nymphs on foxglove, New Haven, June 24.

Tyroglyphus sp., a mite. In tulip bulbs, West Hartford, June 20.

Insects Infesting Stored Food Products

Dermestes vulpinus, hide beetle. Larvae, adults, in car of fish meal, Bridgewater, Mass., June 20.

Grain moths (?). Adults, Hamden, Sept. 15.

Lasioderma serricorne, cigarette beetle. Adults in house, New Haven, Aug. 23.

Oryzaephilus surinamensis, saw-toothed grain beetle. Adults in flour, Norwich, Nov. 18, 1937; Cheshire, Aug. 1; adults in house, Salisbury, May 14; Hamden, Sept. 21.

Plodia interpunctella, Indian-meal moth. Adults, in house, New Haven, Dec. 9, 1937; West Haven, Feb. 19; Plantsville, March 16; Ocean View, Me., May 16; adults in flour, Cheshire, Aug. 1.

Rhizoglyphus phylloxerae, a mite. Infested stock feed, Massilon, Ohio, Sept. 9.

Stegobium (*Sitodrepa*) *paniceum*, drugstore beetle. Adults, in bran cereal, Hartford, Aug. 23; in pantry, Hamden, Aug. 29.

Tenebrio molitor, yellow meal worm. Larva, Plainfield, May 5; adults, Hartford, June 18.

Tenebroides mauritanicus, cadelle. Adults in laboratory, New Haven, Nov. 15, 1937; larvae in rice, New Haven, Aug. 26.

Tribolium confusum, confused flour beetle. Adults, in house, Maine, Dec. 27, 1937.

Weevil (crushed). Adult, Westport, June 2.

Household Insects

Anthrenus scrophulariae, carpet beetle. Adults in house, Southport, Feb. 21; larvae in house, West Haven, April 4; Hamden, May 9, 18; New Haven, June 24, Aug. 19, Oct. 3; Middlebury, May 23; Waterbury, July 12; Newtown, Aug. 5.

Ants (unidentified) in house, Guilford, Sept. 14; New Haven, Oct. 4.

Attagenus piceus, black carpet beetle. Extremely prevalent in houses. Received 22 lots of specimens from 14 localities. Larvae in house, New Haven, Nov. 27, 1937, April 6, May 11, June 14, Aug. 19; East Hartford, March 28; Windsor Locks, April 1; South Norwalk, April 18; Ansonia, April 20; Hamden, April 25, May 18; Waterbury, May 23; Durham, June 13; West Haven, June 20; Plainfield, July 1; Meriden, July 6; Watertown, Aug. 20; larva in milk, New Haven, March 20; adults in house, Hartford, Feb. 9; New Haven, May 10; Hamden, May 18; Cromwell, May 12.

Blatta orientalis, Oriental cockroach. Adult female in house, Hartford, April 25; Waterbury, May 31.

Blattella germanica, German cockroach. Nymph in house, Suffield, Nov. 9, 1937; adults in house, Hamden, Aug. 11.

Bryobia praetiosa, clover mite. In house, Indian Neck, Branford, April 4.

Cartodere costulata, a small Lathridid beetle. Adults in house, West Haven, Sept. 14.

Ctenocephalides canis, dog flea. Adults in house, Norwalk, Nov. 10, 1937; Hartford, April 25, Aug. 10; Norwich, July 19; Meriden, Aug. 8.

Dermestes cadaverinus, a Dermestid beetle. Adults in house, Westport, June 23; New Haven, July 12.

Household Insects—*Continued*

Name — Locality, host, date and remarks

Dermestes lardarius, larder beetle. Larva in house, New Haven, Dec. 9, 1937; adults in cork insulation around ice cream cabinet, Hartford, April 11; adult in house, Plainfield, April 25.

Drosophila funebris, a fruit fly. Adults in house, South Meriden, Dec. 16, 1937.

Gryllus assimilis, field cricket. Adult in house, New Haven, Sept. 2.

Lasius sp., ants in house, Stepney, Nov. 19, 1937; New Haven, Feb. 9; Naugatuck, April 11; Norfolk, July 18.

Lepisma saccharina, silverfish. In house, Milford, Nov. 10, 1937; New Haven, Aug. 9; other specimens which may be this species but were not in shape for identification: New Haven, Feb. 28, June 20, July 30; New Britain, June 25; Hartford, July 6; Bristol, July 21.

Millipede (crushed). In house, Stamford, Aug. 1.

Nacerda melanura, a small beetle. Adults in house, New Haven, July 22.

Parcoblatta pennsylvanica, a wood cockroach. Adults, Leete's Island, June 14.

Psocids (unidentified). In laboratory, Shelton, July 22; under shingles on buildings on island off Branford, July 26.

Scutigera forceps, house centipede. In house, Bridgeport, June 6; New Haven, Oct. 6.

Springtails (unidentified). In house, Momauguin, July 11.

Tetramorium caespitum, pavement ant. Adults in house, Norwalk, Jan. 11; New Haven, Feb. 28, April 11, June 15, 17, July 4; Hamden, April 13, June 16, 20, 21; Ansonia, May 30; Woodbridge, May 25; Greenwich, June 20.

Tineola biselliella, webbing clothes moth. Infested felt pad from card table in house, New Haven, Dec. 16, 1937; adult, Greenwich, May 5; larva in sofa, Milford, Oct. 25.

Troctes divinatorius, book louse. Adults in house, New York City, Aug. 15.

Insects Infesting Timbers and Wood Products

Anobium sp. Damaged wood in old house, Canaan, May 17; East Haddam, June 15; house, Meriden, July 6; damaged table leg, Redding, July 15; damaged wood, Stony Creek, July 19; Thomaston, Sept. 20; adult, Dublin, N. H., July 5.

Buprestid larvae. In firewood, New Haven, Nov. 10, 1937.

Camponotus herculeanus ligniperdus noveboracensis, a large wood-nesting ant. In shingles on cottage, Ridgefield, Oct. 18.

Camponotus herculeanus pennsylvanicus, black carpenter ant. Rather prevalent; 20 lots of specimens from 14 localities. Adults or damaged wood, East Haven, March 3; North Haven, March 17; Madison, April 20; Hartford, April 20, Aug. 1; New London, May 14; New Haven, June 13, July 11, 28, Aug. 2; Orange, May 17; Meriden, June 10, July 15; Rockville, June 15; Waterbury, June 17; Hamden, June 8; West Hartford, May 19, 28; West Haven, Aug. 22; Wilton, June 24.

Cerambycid larvae. Infesting log cabin, Lake Candlewood, April 25.

Crabro sp. (or *Solenius* sp.). Damaged porch post, Naugatuck, June 21; pupa from decayed wood of porch, New Haven, May 11; home timber, Hartford, May 17; cedar cabin, Brookfield, June 18.

Cyllene caryae, hickory borer. Adult, Wethersfield, April 22; larvae and pupae, Mount Vernon, N. Y., Sept. 17.

Enicmus minutus, a small Lathridid beetle. Adults from fuel wood in cellar, Old Greenwich, Sept. 2.

Hexarthrum ulkei, a small beetle. Damaged trim in building, New Haven, April 23.

Insects Infesting Timbers and Wood Products—*Continued*

Name — Locality, host, date and remarks

Lyctus sp. and other powder-post beetles. Damaged wood, Southbury, Nov. 16, 1937; Old Saybrook, Nov. 26, 1937; Branford, July 28; Mississippi River Valley, May 25.

Monochamus sp., one of the pine sawyers. Larvae in pine slabs on camp, Guilford, Aug. 15.

Neoclytus acuminatus, red-headed ash borer. Adults from firewood, New Britain, March 29.

Phymatodes variabilis, a small long-horned beetle. Adults from firewood, New Haven, March 28, April 13, June 27; New Britain, March 29; Hartford, April 16.

Reticulitermes flavipes, termite. Very prevalent; 34 lots of specimens of the insects or their damage, from 20 localities: Torrington, Nov. 5, 1937; Madison, (2 samples) Jan. 28; New Haven, March 22, (2 samples) April 14, 18, 20, May 3, 9; in rhubarb stem, New Haven, July 29, Oct. 28; Hamden, April 19, (2 samples) May 3, 18, June 30; in apple fruit on ground, Hamden, Oct. 5; Woodbridge, March 22; Rye, N. Y., March 24; Westport, March 29; Danbury, April 16; Port Chester, N. Y., April 18; Darien, April 20; Middletown, April 20; West Haven, April 21; Orange, May 3; Meriden, May 4; Wilton, May 11; Canaan, May 17; West Hartford, May 28; Manchester, June 9; Stamford, July 13; Thomaston, Sept. 20.

Xestobium rufovillosum, death-watch beetle. Larvae and adults in house timbers, Woodbridge, March 19; East Haven, March 22; log cabin, Lake Candlewood, April 25.

Xylocopa virginica, carpenter bee. Adults in timber of damaged wood, Hamden, June 1; East Hampton, June 18; Marion, Oct. 19.

Xylotrechus colunus, a long-horned beetle. Adults in house, probably emerged from firewood, New Haven, Feb. 9.

Insects of Soil and Lawn

Anomala orientalis, Asiatic beetle. Very prevalent and damaged lawns in regions infested by this insect. Larvae in lawn, Bridgeport, March 23; New Haven, April 18, 22, May 14, 16, June 20, July 8, Oct. 19; Hamden, Aug. 10, Oct 19.

Ants (unidentified). Workers in lawn, New Haven, May 18, Sept. 1.

Autoserica castanea, Asiatic garden beetle. Increasing in infested regions. Grubs in lawns and gardens, New Haven, May 2, June 1; adults, New Haven, July 21; Darien, July 22; East Norwalk, July 29; Cos Cob, Aug. 6.

Blissus hirtus, hairy chinch bug. Damaged lawns; nymphs, Hamden, July 7; adults, New Haven, July 14; Hamden, Sept. 14; damaged lawns in southwestern Fairfield County, according to Dr. E. P. Felt. Also from Bridgeport, Shelton, West Haven and Westport.

Chlorion ichneumoneum, a solitary Sphecid wasp. Adults, in lawn, Woodmont, Aug. 2; adult, in house, Hartford, Aug. 3; adult, Hamden, Aug. 22.

Cirphis unipuncta, armyworm. Larvae in lawn, Hamden, Aug. 26.

Crambus sp. Larvae in lawn, Waterbury, May 9.

Cutworms in grass, New Haven, Aug. 30.

Lasius sp. in lawn, New Haven, (2 samples) Sept. 13; West Haven, Sept. 16; Hartford, Sept. 15.

Limax maximus, spotted garden slug. On lawn, New Haven, Aug. 16, Sept. 30.

Nematodes in garden soil, Hamden, June 8.

Ochrosidia borealis (*villosa*), a Scarabaeid beetle. Grubs in lawn, Old Greenwich, April 7. More prevalent than usual in Fairfield County.

Odontaeus filicornis, a small Scarabaeid beetle. Adults in golf greens, Cromwell, June 18.

Insects of Soil and Lawn—*Continued*

Name — Locality, host, date and remarks

Phyllophaga gracilis, a small June beetle. Adult, July 15; in flower garden, New Haven, July 21.

Phyllophaga sp., June beetle. Grubs in soil, Wallingford, March 29; in lawn, West Haven, June 30; damaged golf course, Hamden, July 18; in lawn, Winsted, Aug. 15; adults, Waterbury, Oct. 25.

Popillia japonica, Japanese beetle. More prevalent than ever before. Grubs in lawn, New Haven, March 26, May 2, 16, June 3, Aug. 2, Sept. 20; Hamden, May 26; Norwich, Sept. 28; adults, Westport, Aug. 2; Sound View, Sept. 13.

Sphecius speciosus, cicada killer. Adult in building, West Haven, Aug. 1, 15, 17; adults from lawn, Stamford, Aug. 3; Milford, Aug. 8; Seymour, Aug. 15; Georgetown, Aug. 16; Bloomfield, Aug. 16; Hamden, Aug. 22; Waterford, Aug. 23; Bolton, Aug. 25; New Haven, Aug. 26; East Hartford, Aug. 31.

Insects Annoying Man and Domestic Animals

Ctenocephalides canis, dog flea. Adults in house, Hartford, April 25, Aug. 10; Meriden, Aug. 8; Danbury, Oct. 25; larvae in bed, Guilford, Aug. 23; dead larvae in sofa, Hartford, Oct. 25.

Culex sp., mosquitoes. Extremely prevalent in Hartford area and passed through screens, Aug. 1, according to A. W. Morrill, Jr.; also troublesome throughout the State, probably due to heavy rainfall.

Cuterebra sp. Larva infesting cat, Westport, Aug. 26.

Dermacentor variabilis, American dog tick. Adult female on dog, Hamden, Aug. 19.

Fleas (unidentified), some of which may have been dog fleas. Adults in house, Norwalk, Nov. 10, 1937; Norwich, July 19.

Riphicephalus sanguineus, brown dog tick. Female in house, Westport, Dec. 16, 1937.

Sarcophagid fly. Eggs and maggots in dog faeces, Westport, Sept. 12.

Spiders

Epeira trifolium, shamrock spider. Adults, Wallingford, Aug. 26; New Haven, Aug. 30; Sept. 12.

Micrathena gracilis, a flower spider. Young, Norwich, Aug. 12.

Neoscona benjamina, a garden spider. Egg-mass on hawthorn, Darien, Aug. 20.

Salticus scenicus, a jumping spider. In house, Hanover, April 14.

Beneficial Insects

Adalia bipunctata, two-spotted ladybeetle. Larvae on apple tree infested with rosy apple aphid, New Haven, June 6; pupae, Middletown, June 15.

Amara sp., a small ground beetle. Adults in lawn, New Haven, June 25; in golf green (crushed), East Hartford, July 14.

Calosoma sp., a large ground beetle. Adult, in lawn, New Haven, Aug. 29.

Campoplex fugitivus, a parasitic wasp, from red-humped caterpillar on apple, Pleasant Valley, Sept. 9.

Carabid beetle, a ground beetle. Larva in soil, Branford, June 30; adult (crushed), in golf green, East Hartford, July 14; adult, in soil, New Haven, Sept. 1.

Chilocorus bivulnerus, twice-stabbed ladybeetle. Pupa skins from linden tree, New Haven, Jan. 26.

Chlaenius sericeus, a ground beetle. Adult, Waterbury, July 28.

Chrysopa sp., a lacewing. Larva, Barkhamsted, Aug. 15.

Beneficial Insects—*Continued*

Name — Locality, host, date and remarks

Cremastus cookei, an ichneumon fly. Adult, Kingston, R. I., July 12.

Enoclerus quadriguttatus, a predaceous beetle. Adult, Plainfield, April 25.

Ophion bilineatus, an ichneumon fly. Adult, Plainfield, April 25.

Parasite cocoon (empty) on apple tree, Sound View, Sept. 1.

Phymata sp. (crushed), Woodbridge, Sept. 14.

Podisus maculiventris, spined soldier bug. Adult, Avon, Sept. 14.

Tenodera sinensis, Chinese mantid. Egg-mass, West Haven, Feb. 21; Westport, May 18; adults, New Haven, Aug. 29, (2 samples) Sept. 2, 7, 8, 14, Oct. 10, 28; Hamden, Sept. 2, 16; South Lyme, Sept. 6; Sachem's Head, Sept. 15; Meriden, Oct. 5.

Miscellaneous

Abbotana clemataria, a Geometrid moth. Larvae, Hartford, July 2; adult emerged Sept. 25.

Agrotis sp., a cutworm. Larvae crawling on house, Essex, Nov. 9, 1937.

Alaus oculatus, eyed click beetle. Adults, Hartford, June 8; Brooklyn, July 1; Woodbridge, July 11.

Apantesis virgo, a tiger moth. Large black larva, Meriden, June 13.

Apatalodes torrefacta, a moth. Larva, New Haven, Aug. 22.

Aphids (host plants not given), Rockville, June 15; Milford, June 21.

Atomosia puella, a small robber fly. In nests of Crabro or Solenius in porch post, Naugatuck, June 21.

Bibio albipennis, a March fly. Adults resting on fruit trees, Woodbridge, May 13.

Calligrapha lunata, a leaf beetle. Adult, Woodmont, June 20.

Calloides nobilis, a large long-horned beetle. Adult on lawn, New Haven, June 25.

Carabid beetle (broken). Adult in house, Plainfield, May 26.

Ceutorhynchus marginatus, a weevil. Adults in house, Cromwell, May 12.

Chironomus cristatus, a midge. Larvae from activated sludge, Milford, Sept. 22.

Chironomus sp., possibly *C. tentans*. Adult from sewage disposal plant, Milford, Oct. 19.

Chrysochus auratus, green gold beetle. Adults, Salisbury, July 27; Madison, Aug. 2; Woodstock, Aug. 15.

Citheronia regalis, regal moth; hickory horned devil. Caterpillar, New London, Aug. 20.

Collembola, springtails. From wood in cellar, Old Greenwich, Sept. 2.

Corydalis cornuta, hellgramite. Adult, Woodbridge, Aug. 22.

Cynipid (unidentified), a gall wasp. Adult in house, Plainfield, April 25.

Dasymutilla occidentalis, a large red velvet ant. Adults, East Haven, Aug. 16; White Plains, N. Y., Aug. 19.

Datana sp., young larvae. Hamden, Aug. 17.

Deloyala clavata, clavate tortoise beetle. Adults, New Haven, June 20.

Dicerca divaricata, a Bupestrid beetle. Adult, in house, Wilton, July 26.

Euchaetias egle, a tiger moth. Larvae on milkweed, New Haven, Aug. 2.

Euchoeca albovittata, a small moth. Adult, Abington, June 15.

Fumea casta, a small Psychid moth. Larvae in cases, East Haven, June 7.

Galerucella notulata, a small leaf beetle. Adults on ragweed, Pequabuck, Aug. 11.

Miscellaneous—*Continued*

Name — Locality, host, date and remarks

Geometrid moth (unidentified). Larva, Branford, June 30.

Hypera punctata, clover leaf weevil. Adults, Milford, April 27.

Julus hortensis, garden millipede. Broken specimens, Middletown, Nov. 30, 1937.

Laelaps pachypus, mite on a mouse. Lexington, Ky., Jan 26.

Lepidoptera. Adult, New Haven, March 10.

Leptura emarginata, a large red long-horned beetle. Adult, East Hartford, Aug. 31.

Lethocerus americana, giant water bug. Adult in house, Meriden, Aug. 15.

Lithobius forficatus, a centipede. Middletown, Nov. 30, 1937.

Mayfly. Cast skins, Torrington, June 7.

Megachile sp. Case made of leaves, New Haven, Nov. 27, 1937.

Metriona bicolor, golden tortoise beetle. Adult, Hamden, June 23.

Midge (unidentified). In house, Plainfield, May 31.

Millipede (crushed). Plainfield, April 25.

Mites. From bird's nest, New Haven, May 27. May possibly prove to be the chicken mite, *Dermanyssus gallinae*.

Osmoderma eremicola, a black Scarabaeid beetle. Adult on screen, Terryville, Aug. 18.

Panchlora cubensis, Cuban cockroach. Adult in bunch of bananas, Meriden, April 16.

Papilio glaucus var. *turnus*, tiger swallowtail butterfly. Larva, Oakville, Sept. 15.

Papilio philenor, pipevine swallowtail butterfly. Larva, Essex, Sept. 7.

Phanaeus carnifex, a green Scarabaeid beetle. Adults, New Milford, July 5; Stepney Depot, Sept. 1.

Piesma cinerea, a plant bug. Adults on red root, Southington, Aug. 5; on lamb's-quarters, Orient, N. Y., Jan. 5.

Porcellio scaber, a pill bug. Middletown, Nov. 30, 1937.

Samia cecropia, cecropia moth. Cocoon, Bristol, Oct. 24.

Sawfly (unidentified). Adult, Rockville, June 15.

Serica sp. (crushed). Adult on window, Hartford, Aug. 3.

Sminthurid (crushed) in house. Plainfield, May 26.

Sphinx moth (badly battered). Adult in house, Meriden, Aug. 15.

Telea polyphemus, polyphemus moth. Larva on dogwood, Meriden, Aug. 15; cocoon, Bristol, Oct. 24.

Tibicen canicularis, a cicada. Adults, Seymour, Aug. 15; New Haven, Aug. 26; pupa case, Milford, Sept. 2.

Tibicen lyricen, a cicada. Adult, Old Lyme, Aug. 4.

Tibicen sp. Pupa skins in lawn, New Haven, Aug. 29.

Tipulid, a crane fly. Larvae in crevice in elm tree, Granby, Sept. 28.

Trichoptera, a caddis fly (crushed). Adult in house, Cromwell, May 12.

Tyroglyphus heteromorphus, a mite. On tuberous rooted begonia, Wooster, Ohio, April 5.

Utetheisa bella, a small tiger moth. Adult, Hamden, Sept. 7.

Vespa crabro, giant hornet. Adult in house, Newington, Sept. 2.

Xyloryctes satyrus, a large Scarabaeid beetle. Larva under stone, Wilton, May 9.

ADDITIONS TO THE CHECK-LIST OF THE INSECTS OF CONNECTICUT

One of the entomological features of the year has been the publication "Additions to the Check-List of the Insects of Connecticut". *The Check-List*, by W. E. Britton, was published in 1921 as Bulletin No. 31 of the Connecticut Geological and Natural History Survey (331 pp.) and listed 6,781 species and varieties of insects recorded from the State. The Additions (first supplement to the Check-List) is published as Bulletin No. 60 of the same series and adds to the Check-List of Insects 2,088 species, making a total of 8,869 species and varieties of insects now recorded from Connecticut.

To the list of insects has been added a Check-List of Spiders, of about 20 pages, by Dr. B. J. Kaston, containing 393 species and varieties, with separate index.

Although this paper went to press in May, 1938, it was not received from the printers until December. It contains 201 pages, and, like other publications of the Survey, is distributed by the State Librarian at Hartford.

CONFERENCE OF CONNECTICUT ENTOMOLOGISTS

The fifteenth annual conference of entomologists working in Connecticut was held in the Assembly Room at the Connecticut Agricultural Experiment Station, New Haven, Conn., on Friday, October 28, 1938. Professor J. A. Manter was elected chairman and 82 persons were present. Luncheon was served on the premises. Except for the paper of Dr. William Moore, the following program was carried out.

Greeting, Director Wm. L. Slate, New Haven, Conn.

Some Entomological Features of 1938, W. E. Britton, New Haven, Conn.

An Outbreak of the Elm Spanworm in Connecticut in 1938 (lantern slides), G. H. Plumb, New Haven, Conn.

Problems in the Control of Cabbage Worms on Long Island (lantern slides), H. C. Huckett, Riverhead, N. Y.

Discussion on Forest and Shade Tree Insects.

Insect Probabilities Following the Hurricane (lantern slides), E. P. Felt and S. W. Bromley, Stamford, Conn.

Insect Problems at the Tobacco Insect Laboratory (lantern slides), A.W. Morrill, Jr., U.S.D.A., Windsor, Conn.

Federal Gypsy Moth Work in Connecticut, A. F. Burgess, U.S.D.A., Greenfield, Mass.

Methods of Testing Insecticides for Red Spider and Aphid Control, Wm. Moore, Stamford, Conn.

Notes on *Ochrosidia villosa* and the Japanese Beetle in Connecticut, J. P. Johnson, New Haven, Conn.

Studies on the European Red Mite in 1938 (lantern slides), Philip Garman, New Haven, Conn.

Notes on the Control of Vegetable Pests, Neely Turner, New Haven, Conn.

Some Insect Pests of Nursery Stock in Connecticut, M. P. Zappe, New Haven, Conn.

INSPECTION OF NURSERIES, 1938

W. E. Britton and M. P. Zappe

Mr. Zappe began the inspection of registered nurseries on June 18 and inspected 20 small nurseries before July 1. He was assisted during July and August by A. F. Clark, W. T. Rowe and R. J. Walker. Although rainy weather somewhat interfered with the work, by this time most of the larger nurseries had been inspected and during September Mr. Zappe finished inspecting the remaining nurseries, assisted a few times on certain trips by Neely Turner, B. H. Walden and E. M. Stoddard. Several nurseries were visited two or more times to check on the eradication of pests.

As a whole the nurseries were in about the same condition as in 1937. Some had been given excellent care, some indifferent care, and some had been neglected. Spruce gall aphids and the European pine shoot moth were slightly more prevalent than in 1937, and oyster-shell scale, San José scale, white pine weevil, pine leaf scale and poplar canker were a little less prevalent. In 32 nurseries no pests were found. Altogether about 123 different insect pests and 71 plant diseases were found in nurseries in 1938. These cannot all be mentioned here but some of the more important pests that may be carried on nursery stock, with the number of nurseries infested by each for the past 10 years, are shown in the following table:

Table 1. Ten-Year Record of Certain Nursery Pests

Pest	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938
Oyster-shell scale	78	86	73	68	78	104	93	87	84	53
San José scale	22	8	11	10	13	19	17	11	8	2
Spruce gall aphids[1]	147	99	124	141	231	244	285	337	306	312
White pine weevil	37	66	74	70	61	67	98	82	101	97
Pine leaf scale	13	10	20	26	46	66	42	72	60	25
European pine shoot moth	7	17	32	77	137	120	121	108	128	130
Poplar canker	37	35	23	40	34	39	28	28	26	20
Pine blister rust	7	7	13	12	11	7	2	0	4	5
Nurseries uninfested	13	18	32	24	22	21	16	26	25	32
Number of nurseries	266	302	327	351	362	381	373	380	377	402

[1]Includes both *Adelges abietis* and *A. cooleyi.*

Number and Size of Nurseries

The list of nurserymen for 1938 contains 402 names, an increase of 25 over 1937. A classification of nurseries by size may be indicated as follows:

Area	Number	Percentage
50 acres or more	18	4
10 acres to 49 acres	45	11
5 acres to 9 acres	37	9
2 acres to 4 acres	102	26
1 acre or less	200	50
	402	100

Of the 402 nurseries listed for 1938, 20 new nurseries were registered and inspected before the spring shipping season and again in late summer. These are marked "(2)" after the name because each was inspected twice and granted two certificates during the year.

Three nurserymen failed to register before July 1, 1938, and, as provided in Section 2137 of the General Statutes, had to pay the cost of inspection. A minimum fee of $5.00 was charged in each case. All have paid this fee and $15.00 has been turned over to the Treasurer of the Station to be sent to the State Treasurer.

The area of Connecticut nurseries receiving certificates in 1938 is 5,031 acres, an increase of 30 acres over last year. Altogether 42 new nurseries have been added, and 15 have discontinued operations either temporarily or permanently since last year. Some of these registered and some failed to register, but only a few of them notified this office. Consequently it was necessary for the inspector to visit each of the others before learning that they had discontinued the nursery business. Ten nurseries listed in 1937 are on the 1938 list under different names, thus changing the alphabetical arrangement. The nursery list for 1938 contains 402 names, an increase of 25 over that of last year. The nursery firms receiving certificates for 1938 are as follows:

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1938

Name of firm	Address	Acreage	Certificate date	Certificate number
Ackerman, H. S.	West Hartford	2	Nov. 16	4388
Adamcyk, Frank	Deep River	1	Aug. 30	4135
Adamec Evergreen Nursery, George	East Haven	1	July 18	4023
Aldrich, Edward	Guilford	1	Oct. 8	4341
Aldrich, Miss Inie E.	Thomaston	2	Aug. 11	4072
Allara, Dima	Hamden	1	Oct. 8	4339
Allen, Henry L.	Pawcatuck	1	Sept. 30	4311
American Nursery & Tree Expert Co.	Rockfall	40	Aug. 29	4120
Andover Gardens	Andover	1	Sept. 12	4214
Anstett Nursery, Louis	Norfolk	2	Oct. 11	4349
Artistree Nursery	Branford	3	Sept. 13	4224
Austin, M. E.	Clinton	1	Sept. 19	4254
Backiel, Adolf	Southport	1	Dec. 21	4403
Bailey's Nursery, Ralph (2)	West Cornwall	1	Sept. 28	4288
Bakhmeteff, Boris A.	Brookfield	10	Oct. 26	4368
Baldwin, Linus	Middletown	1	Sept. 7	4177
Banak Nurseries	New Britain	4	Sept. 16	4249
Banigan, R. D.	Danielson	1	Aug. 27	4118
Barnes Bros. Nursery Co., The	Yalesville	200	Aug. 24	4106
Barnett, Clifford W.	Ellington	4	Mar. 15	3982
Bartolotta, M. S.	Cromwell	2	Aug. 5	4060
Barton Nursery	Hamden	1	Oct. 5	4325
Beach, Roy G.	Forestville	1	Aug. 29	4128
Beattie, W. H.	New Haven	1	Sept. 19	4255
Bedford Gardens	Plainville	1	Aug. 11	4074
Bedini, Vincent	Ridgefield	3	Sept. 7	4183
Beers, Herbert P.	Southport	1	Dec. 21	4402
Berg, Fred	Stamford	4	Oct. 5	4327
Berkshire Gate Nurseries	Danbury	1	Aug. 29	4123
Bertolf Brothers	Old Greenwich	40	Aug. 19	4092
Biehler, Mrs. Augusta	Plainville	1	Aug. 11	4073

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1938—Continued

Name of firm	Address	Acreage	Certificate date	Certificate number
Blue Hills Nurseries, Inc.	Hartford	28	Oct. 5	4326
Boggini Nursery, L.	South Manchester	1	Sept. 7	4174
Bollerer, F. G.	West Haven	1	Sept. 26	4281
Bonnie Brook Gardens	Rowayton	2	Oct. 6	4335
Booy, H. W.	Yalesville	4	Aug. 29	4124
Brack Nursery	New Milford	2	Oct. 13	4357
Brainard Nursery & Seed Co.	Thompsonville	15	July 28	4047
Branford Nurseries	Branford	6	Sept. 12	4215
Bretschneider, A.	Danielson	1	Aug. 29	4127
Bridgeport Hydraulic Co.	Bridgeport	15	Sept. 8	4186
Brimfield Gardens Nursery	Wethersfield	8	Sept. 8	4189
Bristol Nurseries, Inc.	Bristol	65	Aug. 24	4105
Brooklawn Nursery	Bridgeport	2	Sept. 28	4296
Brooks, H. P.	West Haven	1	Nov. 12	4383
Brookside Nurseries	Darien	5	Aug. 31	4140
Brouwer, Jack	New London	5	Sept. 6	4158
Brouwer's Nurseries, Peter	New London	4	Aug. 19	4088
Brouwer's Nurseries	New London	20	Sept. 1	4149
Bureau of Trees	New Haven	7	July 12	4008
Burke the Florist	Rockville	1	July 26	4038
Burnett's Corners Farm, The	Mystic	2	Sept. 30	4303
Burnside Avenue Greenhouse & Nursery	East Hartford	4	Sept. 20	4265
Burr, Morris L.	Westport	1	Sept. 20	4267
Burr & Co., Inc., C. R.	Manchester	600	July 28	4040
Burwell Seed Company, E. E.	New Haven	1	Sept. 19	4258
Byram Evergreen Nursery	East Port Chester	1	Aug. 22	4097
Cannavo, Tony	Winsted	1	Sept. 28	4283
Cardarelli, E. J.	Cromwell	5	Aug. 10	4070
Cascio Nursery, The Peter	West Hartford	15	Aug. 23	4102
Charlie's Stand	East Hartford	1	Sept. 7	4173
Cherry Hill Nursery, Inc.	Rockfall	5	Aug. 13	4078
Chiapperini & Sons, Michele	Groton	2	Sept. 6	4151
Child's Gardens (2)	Kent	1	Sept. 28	4286
Chippendale Nurseries, Inc.	Old Lyme	2	Oct. 5	4331
Choate School, The	Wallingford	4	Sept. 10	4200
Chudy, Peter	Danbury	1	Sept. 16	4246
City Line Florist	Bridgeport	1	July 28	4048
Cleary's Gardens	Bethel	1	Sept. 7	4166
Clinton Nurseries	Clinton	55	Sept. 13	4219
Clyne Nursery & Florist (2)	Milldale	1	Sept. 28	4294
Coley, H. W.	Westport	1	Oct. 6	4338
Conine Nursery Co., Inc.	Stratford	75	July 30	4055
Conn. Agr. Expt. Station (W. O. Filley, Forester)	New Haven	2	Oct. 3	4320
Connecticut Forestry Nurseries	Deep River	17	Oct. 28	4372
Conn. State College (Prof. S. P. Hollister)	Storrs	2	Sept. 10	4203
Conn. State Forestry Department	Hartford	6	Oct. 13	4354
Conn. State Highway Department	Hartford	18	Oct. 13	4355
Connecticut Valley Nurseries	Manchester	39	July 28	4041
Corrigan's West Haven Nursery	West Haven	1	Sept. 19	4260
Cronamere Alpine Nurseries, Inc.	Greens Farms	6	July 11	4007
Curtiss, C. F.	Milldale	1	Nov. 15	4387
Cylkowski, B.	Simsbury	4	Sept. 14	4229
Daisy Hill Gardens	Derby	1	Nov. 30	4396
Dallas, Inc., Alexander	Waterbury	1	Dec. 9	4398
Damen, Peter J.	East Haven	2	July 18	4024

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1938—(Continued)

Name of firm	Address	Acreage	Certificate date	Certificate number
Darien Nurseries	Darien	6	Aug. 29	4122
Daybreak Nurseries	Westport	3	Nov. 29	4394
Dearden Bros.	East Hartford	5	Sept. 7	4176
DeBaise, Pasquale	Wallingford	1	Sept. 10	4194
DeMars Nursery	Winsted	1	Sept. 28	4292
DesPierre, Lawrence	Hamden	1	July 11	4002
Dewey, V. E.	Groton	2	Oct. 11	4344
Dietrich Nursery, Benj.	Greenwich	4	Oct. 6	4336
Dillon, Thomas	Greenwich	1	Sept. 29	4300
Dingwall, Joseph N.	West Haven	1	Sept. 20	4262
Dixon, Harry	Stamford	2	Oct. 26	4369
Doane, David F.	Haddam	1	Aug. 30	4134
Doebeli, Florist, Charles A.	Bridgeport	1	Nov. 30	4395
Donovan, Daniel	Talcottville	1	Oct. 25	4366
Donovan, John N.	Rocky Hill	3	Sept. 7	4185
Drenckhahn, Ernest J.	Cos Cob	10	Aug. 5	4063
Dudley, Grace W.	Guilford	1	Aug. 29	4131
Dunlap's Dollar Evergreens	Cromwell	3	Aug. 23	4104
Eager, Edward M.	Bridgeport	1	Aug. 22	4095
East Haven Nursery	East Haven	1	July 11	4003
Edgewood Nurseries	New Haven	1	Sept. 20	4263
Elfgren Nurseries	East Killingly	3	Aug. 30	4137
Ellington Evergreen Nursery (2)	Ellington	3	July 22	4032
Ellmer, Karl	Cannondale	2	Nov. 1	4375
Ellsworth Nursery, The	Newington	1	Sept. 7	4169
Elm City Nurseries	New Haven	1	Sept. 15	4238
Elmgren Nursery	Cromwell	1	Oct. 8	4343
Elm Grove Cemetery Association	Mystic	1	Sept. 30	4305
Evergreen Nursery Co.	Wilton	30	July 29	4054
Evergreens, The	Southport	2	Nov. 12	4384
Fairlawn Nursery	West Hartford	1	Sept. 8	4192
Fairway Gardens	Woodmont	1	Sept. 14	4233
Farmington Valley Nursery	Avon	5	Oct. 5	4328
Ferchau, Hugo	Milford	1	Aug. 13	4080
Flower City Rose Co.	Manchester	23	July 28	4042
Follett Nursery	Westport	10	Aug. 31	4141
Fountain Nurseries	Farmington	10	Sept. 6	4157
Foxon Park Nursery	East Haven	1	July 12	4009
Frank & MacArthur	Ansonia	1	Nov. 10	4378
Fraser's Nurseries & Dahlia Gardens	Willimantic	3	Sept. 7	4184
Frede, Wm. Frederick	Danbury	1	Sept. 15	4237
Freitag, John G. (2)	New Haven	1	Oct. 5	4333
Galligan, Clarence W.	New Haven	1	Sept. 19	4257
Gallup, Amos M.	Pawcatuck	1	Sept. 30	4310
Garden of Romance, The	Old Saybrook	3	Sept. 12	4217
Gardner's Nurseries	Rocky Hill	300	Aug. 13	4076
Geduldig's, Florist & Nurseryman	Norwich	7	Sept. 10	4206
George's Hill Nursery	Southbury	1	Sept. 16	4248
German, Peter B.	Fairfield	1	Sept. 23	4278
Giana, John F.	Kensington	1	Aug. 29	4121
Giant Valley Nursery	Mount Carmel	1	July 28	4050
Gilbert, Henry G.	Danielson	2	Nov. 10	4382
Glastonbury Gardens	Glastonbury	4	July 21	4028
Glenbrook Greenhouses	Glenbrook	2	Sept. 12	4208
Glen Terrace Nurseries	Hamden	70	Nov. 26	4392
Glenwood Nurseries	Clinton	2	Sept. 21	4268
Godfrey, Stratfield Nursery, George R.	Bridgeport	50	Oct. 11	4347

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1938—(Continued)

Name of firm	Address	Acreage	Certificate date	Certificate number
Golden Hill Nurseries	Shelton	3	Nov. 2	4376
Goodwin Nurseries	Bloomfield	7	July 28	4049
Goshen Nurseries	Goshen	6	Oct. 11	4350
Gosnell, Evelyn	Westport	1	Sept. 21	4270
Great Pond Nursery	Simsbury	1	Sept. 14	4228
Green Acre Farms, Inc.	Waterford	1	Sept. 7	4180
Green, Wm. P.	South Windsor	3	Oct. 13	4359
Grillo, N.	Milldale	1	Aug. 10	4069
Griswold, George	Old Lyme	1	Sept. 1	4146
Gunn, Mrs. Charles	Kent	1	Nov. 3	4377
Haas, Florist	Milford	1	Oct. 11	4351
Hall, Henry A. L.	West Haven	1	Sept. 19	4259
Hamden Nursery	Hamden	1	Sept. 13	4223
Hansen's Florist & Nursery	Fairfield	5	Aug. 5	4061
Hansen's Garden	Newington	3	Sept. 7	4179
Happy Days Farm	Norwalk	10	Oct. 11	4345
Hearn, Thomas H.	Washington	3	Oct. 1	4316
Heath & Co.	Manchester	15	July 28	4043
Henninger, Christ.	New Britain	1	Sept. 7	4172
Hettinger, Joseph O.	Manchester	1	July 23	4036
Hildebrand's Nursery	Norwich	1	Sept. 6	4156
Hilding Bros.	Amston	1	Sept. 6	4153
Hillcrest Gardens	Woodbridge	4	July 18	4021
Hilliard, H. J.	Sound View	1	Aug. 30	4138
Hilltop Nurseries	Orange	1	July 18	4020
Hinckley Hill Nursery	Stonington	1	Sept. 30	4309
Hiti Nurseries	Pomfret Center	11	Aug. 29	4126
Hoffmann's Nurseries	Hartford	2	Sept. 12	4212
Hofmann, Wm. T.	Cromwell	2	July 26	4039
Holcomb's Evergreen Nursery	Winsted	6	Oct. 11	4352
Holdridge & Sons, S. E.	Norwich	3	Aug. 27	4115
Hope Street Nursery	Springdale	1	Sept. 30	4313
Horan, J. F.	Hartford	1	Sept. 8	4188
Horan, Kieran W.	West Hartford	1	Sept. 10	4204
Horowitz, Ben	East Hampton	1	Aug. 26	4114
Hosking, James S.	Watertown	1	Sept. 16	4242
Hotchkiss, H. L.	North Haven	1	Sept. 19	4256
Hotchkiss, Sr., Wallace M.	Norfolk	1	Sept. 28	4285
Houston's Nurseries	Mansfield Depot	5	Oct. 20	4365
Hoyt, Charles E.	Bethel	35	July 21	4026
Hoyt's Sons Co., Inc., Stephen	New Canaan	500	Aug. 12	4075
Hurlburt Nursery	Hamden	1	Sept. 7	4182
Hutt, Robert F.	Glastonbury	3	Oct. 6	4337
Hyatt, Thaddeus	Stamford	10	Oct. 29	4374
Isselee's Sons, Inc., Chas.	Darien	5	Aug. 25	4111
Johnson, Harry L.	South Meriden	1	Sept. 20	4266
Johnson, Lincoln	Stamford	15	Sept. 23	4277
Johnson, Tom	Stratford	1	Sept. 23	4276
Joyosa Gardens (2)	Cornwall Bridge	1	Sept. 28	4289
Kateley, Milton M.	East River	1	Oct. 4	4322
Kauser, Alice	Norwalk	1	July 12	4010
Kelley & Son, James J.	New Canaan	6	Aug. 29	4125
Kellner, Arthur H.	Norwalk	1	July 11	4005
Keogh, Harry W.	Norwalk	2	July 21	4031
Keser's Sons, Inc., Otto	Portland	1	Sept. 7	4178
Key Rock Gardens	Newtown	2	Sept. 17	4252

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1938—(Continued)

Name of firm	Address	Acreage	Certificate date	Certificate number
Knobling, Edmund	Danbury	3	Sept. 6	4160
Kupillas Nursery, Joseph (2)	East Haven	1	Sept. 10	4195
Lanedale Farm Nurseries	New Canaan	10	Aug. 17	4086
Langstroth Nurseries	Danbury	6	Sept. 6	4159
Laviola, Cosmo	New Haven	1	July 18	4019
Lawrence Greenhouses	Branford	1	Dec. 2	4397
Leghorn's Evergreen Nursery	Cromwell	25	Aug. 13	4079
Lemmon, Robert S.	New Canaan	1	July 29	4051
Lewis Gardening Service	Kensington	1	Aug. 31	4144
Lewis & Valentine Landscape Corp.	Darien	9	Aug. 19	4093
Lowescroft Gardens	Manchester	1	July 12	4014
Luce, Mrs. Charles L.	Newington	1	Sept. 7	4167
Luckey, Ada Mae	Greens Farms	1	July 12	4011
Luckner, Jr., William	Stepney	1	Sept. 8	4190
Lynch, Mrs. John H.	Ridgefield	3	Aug. 31	4139
Malleable Iron Nursery	Branford	2	Sept. 8	4191
Maplewood Nursery Co.	Norwich	2	Sept. 19	4253
Marigold Farm	New Canaan	20	Aug. 17	4082
Marlboro Gardens	Marlborough	3	Sept. 10	4196
Mather Homestead	Darien	1	Aug. 25	4108
Mayapple Nursery	Stamford	1	Oct. 28	4371
McCarthy, John P.	Danbury	1	Sept. 7	4181
McConville's Greenhouses & Nurseries	Manchester	2	July 13	4017
McDermott, E. F.	Windsor	1	Sept. 28	4298
Meier, A. R.	West Hartford	1	Sept. 15	4235
Melville Nurseries	Fairfield	1	Oct. 1	4317
Merritt, W. C.	Winsted	6	Oct. 13	4360
Merwin Lane Nursery	East Norwalk	3	Oct. 5	4330
Meyer Nursery, Ludwig	Bridgeport	5	July 30	4056
Middeleer	Darien	10	Aug. 19	4091
Milford Nursery	Milford	2	July 22	4033
Millane Nurseries & Tree Experts, Inc.	Cromwell	100	Aug. 10	4067
Mill River Nursery	Fairfield	15	Aug. 31	4143
Millstone Garden	Terryville	1	Aug. 11	4071
Minge, G. H.	Rocky Hill	1	Sept. 8	4187
Moore Hill Nurseries	Waterford	1	Aug. 25	4107
Moraio Bros.	Old Greenwich	5	Aug. 22	4099
Morgan & Sons, Wm. F.	North Stonington	3	Sept. 30	4307
Mountain Grove Cemetery Association, The	Bridgeport	1	Aug. 17	4081
Mount Airy Gardens	Stamford	1	Sept. 12	4207
Mount Carmel Nursery	Mount Carmel	1	Nov. 14	4386
Munro, Edward A.	New Haven	1	Sept. 28	4295
New England Water Lily Gardens	Manchester	1	Sept. 7	4170
New Era Seed Co.	Clinton	3	Sept. 13	4220
New Haven Park Commission	New Haven	10	July 22	4034
Newington Gardens & Nurseries	Newington Junction	1	Sept. 7	4168
New London Cemetery Association	New London	1	Aug. 31	4142
New London County Nurseries	New London	5	Nov. 25	4391
Newton's Nursery	West Granby	1	Sept. 23	4274
Newtown Gardens	Newtown	1	Nov. 10	4380
New York, New Haven & Hartford R. R.	Stamford	4	Sept. 13	4226
Niantic Bouquet Shop	Niantic	1	Aug. 19	4089
North Avenue Nursery	Bridgeport	1	Sept. 1	4150
North-Eastern Forestry Co.	Cheshire	96	Aug. 4	4058

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1938—(Continued)

Name of firm	Address	Acreage	Certificate date	Certificate number
North Greenwich Nursery	Greenwich	1	Aug. 17	4084
North Street Gardens	Milford	1	July 12	4012
Northville Gardens	New Milford	1	Oct. 11	4353
Norwalk Perennial Garden (2)	Norwalk	4	Sept. 13	4225
Nyveldt's Nursery	New London	2	Aug. 19	4090
Oakland Nurseries	Manchester	20	July 28	4044
Olde Mill Brook Nursery, Ye	Hamden	2	Nov. 26	4393
Oldfield Nursery	Stratford	1	July 18	4022
Old Orchard Nursery	Norwalk	2	Sept. 23	4275
Outpost Nurseries, Inc.	Ridgefield	700	Aug. 4	4059
Ouwerkerk, Dirk K.	Yalesville	10	Aug. 23	4101
Over-the-Garden-Wall	West Hartford	3	July 21	4027
Oxoboxo Nursery	Montville	2	Sept. 6	4155
Palmieri Nursery & Florist	New Haven	1	July 21	4030
Park Place Nurseries	Marion	2	Sept. 23	4271
Partrick Nursery	Sandy Hook	1	Sept. 23	4279
Pendleton's Flower Gardens	Norwich	2	Aug. 27	4117
Peschko, Robert	Danbury	1	Sept. 16	4247
Pestretto, Frank	West Hartford	1	Sept. 10	4198
Pestretto, Salvatore	Hartford	1	Sept. 10	4201
Peterson's Flower Shop	West Hartford	1	Oct. 5	4329
Pflomm, Charles W.	Bridgeport	1	July 11	4006
Pierson, Inc., A. N.	Cromwell	300	Aug. 9	4064
Pinchbeck Bros., Inc.	Ridgefield	10	Aug. 31	4145
Pine Hirst Gardens	Guilford	1	Aug. 29	4130
Pine Plains Greenhouses	Norwich	2	Sept. 13	4221
Platt, Kenneth M. & Norman E.	Milford	1	Sept. 20	4261
Polen, Romuald	Southport	2	Sept. 29	4302
Polish Orphanage Farm	New Britain	1	Sept. 7	4171
Pomeroy Nurseries	New Milford	2	Oct. 3	4318
Price, Hickman (2)	Southport	5	Nov. 10	4379
Prospect Nurseries, Inc.	Cromwell	28	Aug. 9	4065
Q Garden Farm	Milford	1	Sept. 6	4152
Rabinak Flower Farm	Deep River	3	Sept. 6	4154
Race Brook Gardens	Orange	1	July 18	4018
Reliable Nursery, The	East Hartford	2	Sept. 17	4250
Rengerman's Garden	Granby	1	Sept. 14	4227
Reveley Landscaping Service, The	Clinton	2	Sept. 14	4231
Reynolds' Farms	South Norwalk	1	July 29	4052
Richmond, Gordon L.	New Milford	15	Sept. 28	4293
Ridgewood Nurseries	Milford	1	Sept. 10	4199
Rielless, A. M. & Stephen Bucko, Jr. (2)	Danbury	1	Sept. 16	4245
Riese, F. K. (2)	Watertown	1	Sept. 16	4244
Riverside Farm (2)	Milford	2	Aug. 30	4136
Robinson Estate, Seymour N.	West Hartford	2	Sept. 6	4161
Rockfall Nursery Co.	Rockfall	4	Aug. 13	4077
Rolf, Mrs. Fred H.	Guilford	1	Nov. 12	4385
Rose Hill Nursery	Gildersleeve	3	Sept. 21	4269
Ross Bros. (2)	Manchester	10	July 28	4046
Russell St. Perennial Garden	Manchester	1	July 12	4015
Sage Brothers	North Woodbury	1	Sept. 16	4241
Sakson's Nursery	Greenwich	1	Aug. 17	4085
Sandelli Greenhouses	New Britain	1	Dec. 10	4399
Savanella Bros. Nursery	Torrington	2	July 11	4004

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1938—(Continued)

Name of firm	Address	Acreage	Certificate date	Certificate number
Scarano, Alphonse	Groton	1	Sept. 6	4165
Schaeffer, Peter	Ledyard	2	Aug. 27	4116
Schleichert Nursery	Bridgeport	4	Nov. 23	4390
Schneider, Adolf	Milford	1	Oct. 5	4332
Schuller, John	Higganum	2	Sept. 7	4175
Schulze, Charles T.	Bethel	1	Dec. 17	4401
Schulze, Edward E.	Bethel	1	Sept. 29	4301
Scott's Nurseries	Bloomfield	10	Sept. 10	4205
Scotty's Landscape Service	Woodbury	1	Sept. 16	4240
Sears, Roebuck & Co.	Manchester	10	July 28	4045
Seltsam's Pequonnock Gardens	Bridgeport	1	Oct. 28	4373
Seymour Gardens, Prudence	New Milford	1	Sept. 28	4291
Seymour's Hemlock Nursery	Riverton	1	Sept. 28	4284
Sharon Valley Nursery	Sharon	1	July 12	4013
Silver City Nursery	Meriden	5	July 23	4037
Simonsen, H. C.	Plainville	3	Sept. 6	4162
Sipocz Arrowhead Farm	Fairfield	1	Oct. 28	4370
Smith, Edward A.	Mystic	1	Sept. 30	4304
Soltes Nursery, M. J.	Shelton	2	Sept. 26	4282
Southbury Nursery, The (2)	Southbury	4	Sept. 20	4264
Southington Nursery	Southington	15	Aug. 22	4100
Southport Nursery	Southport	35	Aug. 2	4057
South Wilton Nurseries	Wilton	8	Aug. 5	4062
Springdale Florist,	Springdale	1	Nov. 10	4381
Spring Nurseries	Forestville	1	Oct. 5	4334
Stack, Garrett M.	Guilford	1	Aug. 29	4133
Stafford Conservatories	Stafford Springs	1	July 21	4025
Standish, Norman S.	Hanover	1	Oct. 18	4364
Stannard, Julia	Wilton	2	Sept. 12	4211
State Street Nursery	Hamden	4	Sept. 13	4222
Steck, Charles A.	Newtown	20	Oct. 4	4321
Steck Nursery	Bethel	4	Oct. 11	4346
Steele's Nurseries, Charles	Greenwich	2	Aug. 18	4087
Stocking, Milton C.	Simsbury	1	Dec. 14	4400
Strayer, Paul	Stratford	1	July 21	4029
Sunny Ridge Nursery	Bethel	1	Sept. 15	4236
Sunny Valley Nursery	New Milford	11	Oct. 11	4348
Sunridge Nurseries	Greenwich	75	Aug. 22	4098
Sun Rise Nursery	North Haven	1	Sept. 23	4272
Swendson, Hans	Cheshire	1	Aug. 25	4110
Sylvan Greenhouse & Nursery	Bridgeport	2	Oct. 1	4315
Taylor, Walter G.	Wallingford	1	Sept. 1	4147
Thomson Co., W. W.	West Hartford	4	Sept. 15	4234
Tierney, Wm. L. (2)	Greenwich	2	Oct. 25	4367
Tobin, Daniel J. (2)	Ridgefield	2	Sept. 23	4273
Tollgate Nursery	Avon	1	Sept. 14	4230
Torizzo, P. A.	West Hartford	5	Sept. 12	4216
Tower Crispette Co.	Guilford	1	Aug. 29	4132
Tow Path Gardens, Inc.	Hartford	8	Oct. 13	4356
Tracy, B. Hammond	Yalesville	1	Aug. 25	4112
Triangle Nursery	Yalesville	2	Aug. 22	4096
Twin Pines Gardens	New Milford	1	Sept. 28	4290
Uplands Flower Gardens	Woodbury	1	Sept. 16	4239
Valentine, Wm. (2)	Pomfret Center	1	Oct. 5	4324
Valley View Nursery	Southington	1	Aug. 23	4103
Van der Bom, Mrs. F.	Bethel	6	Sept. 14	4232
Vanderbrook & Son, C. L.	Manchester	42	July 13	4016

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1938 —(Concluded)

Name of firm	Address	Acreage	Certificate date	Certificate number
Van Horn & Harrington	Suffield	1	Sept. 8	4193
Van Wilgen Nurseries	Branford	22	Sept. 17	4251
Van Wilgen, William	Branford	1	Sept. 13	4218
Vasileff Nursery	Greenwich	5	Aug. 19	4094
Verkade's Nurseries	New London	60	Sept. 6	4164
Vernick's Nurseries & Landscape Service	Bridgeport	2	Sept. 28	4299
Wallace Nursery	Wallingford	5	Sept. 1	4148
Wallingford Nurseries of the Barnes Nursery & Orchard Co.	Wallingford	60	Oct. 15	4362
Ward & Son, J. F.	Windsor	1	Aug. 9	4066
Watertown Nurseries	Watertown	1	Sept. 16	4243
Weinberger, William	Ridgefield	1	Aug. 29	4129
West Cornwall Nurseries (2)	West Cornwall	1	Sept. 28	4287
Westerly Nurseries	Pawcatuck	3	Oct. 15	4363
West Mystic Gardens	West Mystic	1	Sept. 30	4306
Westover Trading Corporation	Stamford	1	Sept. 28	4297
West Street Nursery	Danbury	1	Aug. 25	4113
Westville Nurseries	New Haven	2	Nov. 16	4389
Wethersfield Nursery	Wethersfield	3	Sept. 10	4197
Wheeler, Charles B.	Stonington	1	Sept. 30	4308
Whipple, Earle G.	Danielson	1	Oct. 13	4358
White Memorial Foundation (2)	Bantam	30	Oct. 8	4342
Whittemore Co., J. H.	Naugatuck	3	Oct. 4	4323
Wildflower Nursery	Brookfield	1	Sept. 23	4280
Wild's Nursery, Henry	Norwalk	30	Aug. 17	4083
Willow Gardens	Darien	1	Aug. 10	4068
Willson, Stewart H. (2)	Thompsonville	1	Sept. 12	4210
Wilridge Nurseries	Ridgefield	5	Aug. 25	4109
Wilson Landscape Co., The	Hartford	1	Sept. 12	4209
Wilson, M. L.	Litchfield	5	Aug. 29	4119
Wilson Nurseries, C. E.	Manchester	125	July 22	4035
Woodbridge Nurseries	New Haven	4	Sept. 12	4213
Woodcrythe Nursery, E. H. Sloan	New Canaan	1	July 29	4053
Woodmont Nurseries	Woodmont	60	Oct. 15	4361
Wyllie, David	North Haven	1	Oct. 3	4319
Yale University Forest School Nursery	New Haven	1	Oct. 8	4340
Yale University Landscape Department	New Haven	5	Sept. 10	4202
Young's Nurseries	Wilton	2	Sept. 30	4312
Zack Co., H. J.	Deep River	10	Sept. 6	4163
Total 402 nurseries		**5,031 acres**		

The cost of inspecting these nurseries in 1938, including certain additional visits to make sure that pests had been eradicated, was approximately $1,730.80.

Other Kinds of Certificates Issued

During 1938, 150 duplicate certificates were issued to Connecticut nurserymen, to be filed in other states. Altogether 94 dealer's permits were issued to registered dealers who do not grow the nursery stock that they sell. Shippers' permits to the number of 243 were issued to nurserymen

in other states, who wish to ship stock into Connecticut. Also, 1,019 parcels of nursery stock were inspected and certified for shipment to accommodate individuals.

There were also issued 185 miscellaneous certificates and special permits, 240 blister rust control area permits, 961 corn borer certificates, and 2,217 certificates for packages of shelled corn and other seeds, many of which were consigned to foreign countries.

Inspection of Imported Nursery Stock

The quantity of nursery stock entering Connecticut from foreign countries in 1937-1938 was slightly less than in the preceding year. The number of shipments, number of cases and number of plants were all smaller. This stock entered the United States under regulations and permits issued by the Federal Bureau of Entomology and Plant Quarantine, and at regular ports of entry was released for transit to destination points, where it was examined by state inspectors.

In 1937-1938 there were 13 shipments containing 51 cases and 385,000 rose plants, all of which were stocks for propagation. Of these plants, 355,000 were *Rosa manetti* and 30,000 were *Rosa multiflora.* All were inspected by Mr. Zappe. This stock was imported by four commercial rose growers, who received 250,000, 80,000, 30,000 and 25,000 plants respectively, and came from the following sources:

Country	No. shipments	No. plants
Holland	12	345,000
England	1	40,000
	13	385,000

The time required to inspect this rose stock was equivalent to eight days' work for one man, and together with the cost of travel (805 miles) and other necessary expenses, amounted to approximately $133.80. Reports of the 13 shipments were sent to the Federal Bureau of Entomology and Plant Quarantine.

Results of Inspection

Of the 13 shipments inspected, three, or 23 percent, were found infested with insects—a sawfly, *Emphytus cinctus* Linn., which evidently had entered the pith of the cut stems seeking a place to pupate. Two shipments, or 15 percent, were infected with crown gall, a bacterial disease.

In addition to the rose stocks mentioned above, the following miscellaneous plants and seeds entered Connecticut, after Federal inspection at ports of entry. These were not inspected in Connecticut: 200 Kentia palm seeds, 100 Cocos palm seeds, 1,648 pounds of tree and shrub seeds, 28 iris rootstocks, 81 dahlia tubers, 600 mountain ash seedlings, 26 rose bushes and 3 syringa.

INSPECTION OF APIARIES, 1938

W. E. Britton

In 1938, as in previous years, two inspectors covered the State. Mr. H. W. Coley of Westport inspected bees in the four southern counties of Fairfield, New Haven, Middlesex and New London, while Mr. W. H. Kelsey of Bristol covered the four northern counties of Litchfield, Hartford, Tolland and Windham. This year no American foul brood was found in Middlesex County, although the percentage of apiaries in the State infected with this disease remains the same as in 1937.

Altogether, 1,609 apiaries containing 10,705 colonies were inspected in 1938. These averaged 6.7 colonies per apiary as against 7.1 in 1937. There were 199 colonies in 121 apiaries infected with American foul brood; 36 of these were inspected twice, and 4, three times.

The total cost of this inspection in 1938 was $1,901.45, of which $818.75 was from the balance of the appropriation for the fiscal year ending June 30, 1938, and $1,082.70 from the appropriation of $2,110.00 for the present fiscal year, available July 1, 1938.

Table 2. Twenty-Nine Year Record of Apiary Inspection in Connecticut

Year	Number apiaries	Number colonies	Average No. colonies per apiary	Average cost of inspection	
				Per apiary	Per colony
1910	208	1,595	7.6	$2.40	.28
1911	162	1,571	9.7	1.99	.21
1912	153	1,431	9.3	1.96	.21
1913	189	1,500	7.9	1.63	.21
1914	463	3,882	8.38	1.62	.19
1915	494	4,241	8.58	1.51	.175
1916	467	3,898	8.34	1.61	.19
1917	473	4,506	9.52	1.58	.166
1918	395	3,047	7.8	1.97	.25
1919	723	6,070	11.2	2.45	.29
1920	762	4,797	6.5	2.565	.41
1921	751	6,972	9.2	2.638	.24
1922	797	8,007	10.04	2.60	.257
1923	725	6,802	9.38	2.55	.27
1924	953	8,929	9.4	2.42	.25
1925	766	8,257	10.7	2.45	.22
1926	814	7,923	9.7	2.35	.24
1927	803	8,133	10.1	2.37	.234
1928	852	8,023	9.41	2.12	.225
1929	990	9,559	9.55	2.19	.227
1930	1,059	10,335	9.76	2.01	.206
1931	1,232	10,678	8.66	1.83	.212
1932	1,397	11,459	8.2	1.60	.195
1933	1,342	10,927	8.1	1.69	.208
1934	1,429	7,128	4.98	1.40	.28
1935	1,333	8,855	6.64	1.556	.234
1936	1,438	9,278	6.45	1.429	.221
1937	1,437	10,253	7.1	1.28	.18
1938	1,609	10,705	6.7	1.18	.177

Table 2 shows the number of apiaries and colonies inspected, the average number of colonies per apiary and the average cost of inspecting each apiary and colony for each year since inspection began in 1910.

In 1938 apiaries were inspected in 155 towns. Inspections were made in the following 14 towns not visited in 1937:

Fairfield County: Fairfield, Weston; *New Haven County:* Beacon Falls, Branford, Cheshire, Milford; *Middlesex County*: Cromwell, Killingworth; *Windham County*: Eastford, Killingly, Pomfret, Putnam, Thompson, Woodstock.

On the other hand, in the following eight towns visited in 1937 no inspections were made in 1938:

Fairfield County: Easton, Shelton; *New Haven County:* Guilford, Madison; *Hartford County*: Enfield; *Tolland County*: Union, Willington; *Windham County*: Sterling.

There were eight apiaries infected with sacbrood and 121 apiaries infected with American foul brood.

In 1938 American foul brood was discovered in the following 59 towns:

Fairfield County: Bridgeport, Danbury, Darien, Greenwich, New Fairfield, Ridgefield, Stamford, Wilton; *New Haven County*: Cheshire, Hamden, Meriden, Middlebury, Milford, Wallingford, Woodbridge; *New London County*: East Lyme, North Stonington, Norwich, Preston, Stonington; *Litchfield County*: Bethlehem, Harwinton, Litchfield, Morris, New Milford, North Canaan, Plymouth, Salisbury, Sharon, Thomaston, Torrington, Warren, Washington; *Hartford County*: Berlin, Bloomfield, Bristol, Canton, Farmington, Glastonbury, Granby, Hartford, Hartland, New Britain, Newington, Plainville, Simsbury, Southington, Suffield, West Hartford, Windsor, Windsor Locks; *Tolland County*: Coventry, Hebron, Mansfield, Stafford; *Windham County*: Ashford, Brooklyn, Plainfield, Windham.

Statistics of Inspection

The statistics of apiary inspection by towns and counties are shown on the following pages, with summary on page 39.

Table 3. Inspection of Apiaries, 1938

Town	Apiaries		Colonies	
	Inspected	Diseased (Am. f. b.)	Inspected	Diseased (Am. f. b.)
Fairfield County				
Bethel	6	—	36	—
Bridgeport	2	1	14	2
Danbury	8	2	56	3
Darien	5	1	91	1
Fairfield	17	—	139	—
Greenwich	7	1	43	1
Monroe[1]	12	—	100	—
New Canaan	4	—	56	—

[1]Two colonies of sacbrood

TABLE 3—Continued

Town	Apiaries Inspected	Apiaries Diseased (Am. f. b.)	Colonies Inspected	Colonies Diseased (Am. f. b.)
Fairfield County—Continued				
New Fairfield[2]	14	1	132	4
Newtown	7	—	67	—
Norwalk	6	—	29	—
Ridgefield	6	3	39	5
Sherman	7	—	42	—
Stamford	11	2	58	2
Stratford	1	—	45	—
Trumbull	6	—	31	—
Weston	2	—	3	—
Westport	3	—	33	—
Wilton	9	1	106	3
	133	12	1,120	21
New Haven County				
Beacon Falls	1	—	21	—
Branford	5	—	47	—
Cheshire	1	1	14	2
East Haven	3	—	41	—
Hamden	8	1	53	1
Meriden[3,4]	19	1	169	1
Middlebury	5	1	74	1
Milford	3	1	28	1
Naugatuck	3	—	33	—
New Haven	1	—	4	—
North Branford	2	—	32	—
North Haven	4	—	32	—
Orange	4	—	59	—
Oxford	5	—	36	—
Prospect	3	—	22	—
Seymour	7	—	48	—
Southbury[1]	5	—	144	—
Wallingford	5	1	92	1
Waterbury	10	—	46	—
Wolcott	3	—	15	—
Woodbridge	9	5	30	7
	106	11	1,040	14
Middlesex County				
Chester	3	—	22	—
Clinton	3	—	30	—
Cromwell	6	—	51	—
Durham	5	—	38	—
East Haddam	9	—	125	—
East Hampton	18	—	113	—
Essex	7	—	48	—
Haddam	6	—	44	—
Killingworth	1	—	8	—
Middlefield[5]	4	—	124	—
Middletown	13	—	112	—
Old Saybrook[4]	11	—	56	—

[1]Two colonies of sacbrood.
[2]Three apiaries inspected twice.
[3]One colony of sacbrood.
[4]One apiary inspected twice.
[5]Five colonies of sacbrood.

TABLE 3—Continued

Town	Apiaries Inspected	Apiaries Diseased (Am. f. b.)	Colonies Inspected	Colonies Diseased (Am. f. b.)
Middlesex County—Continued				
Portland	8	—	67	—
Saybrook[1]	7	—	50	—
Westbrook	5	—	47	—
	106	0	935	0
New London County				
Bozrah	1	—	60	—
Colchester	20	—	195	—
East Lyme[4]	4	2	14	4
Franklin	3	—	67	—
Griswold	13	—	84	—
Groton	11	—	92	—
Lebanon[4,3]	8	—	190	—
Ledyard	9	—	67	—
Lisbon	3	—	82	—
Lyme	9	—	125	—
Montville	7	—	57	—
New London	3	—	21	—
North Stonington	3	1	34	2
Norwich	9	1	198	1
Old Lyme	7	—	30	—
Preston	2	1	44	3
Salem	2	—	23	—
Sprague	2	—	15	—
Stonington	20	3	158	7
Voluntown	3	—	17	—
Waterford	11	—	136	—
	150	8	1,709	17
Litchfield County				
Barkhamsted	7	—	20	—
Bethlehem[4,6]	16	4	141	14
Bridgewater	6	—	50	—
Canaan	2	—	6	—
Colebrook	7	—	61	—
Cornwall	6	—	43	—
Goshen	12	—	45	—
Harwinton	10	1	46	1
Kent	2	—	15	—
Litchfield	25	4	157	8
Morris	8	1	22	1
New Hartford	13	—	36	—
New Milford	30	1	192	3
Norfolk	5	—	18	—
North Canaan[4]	8	2	63	2
Plymouth[4]	15	3	110	6
Roxbury	8	—	44	—
Salisbury[4]	16	2	64	2
Sharon[4]	16	1	268	2
Thomaston	8	2	59	4
Torrington	23	2	89	2

[1]Two colonies of sacbrood.
[3]One colony of sacbrood.
[4]One apiary inspected twice.
[6]One apiary inspected three times.

TABLE 3—Continued

Town	Apiaries Inspected	Apiaries Diseased (Am. f. b.)	Colonies Inspected	Colonies Diseased (Am. f. b.)
Litchfield County—Continued				
Warren[7,6]	13	4	57	4
Washington[4]	17	2	68	6
Watertown	22	—	158	—
Winchester	10	—	40	—
Woodbury[7]	12	—	83	—
	317	29	1,955	55
Hartford County				
Avon	9	—	31	—
Berlin[7]	23	3	137	3
Bloomfield	25	3	168	3
Bristol[4,6]	22	1	109	1
Burlington	10	—	49	—
Canton[4]	13	2	54	2
East Granby	11	—	39	—
East Hartford	29	—	104	—
East Windsor	9	—	70	—
Farmington[4]	16	2	68	3
Glastonbury	33	1	136	2
Granby	17	1	61	1
Hartford[4]	13	1	96	1
Hartland	8	2	41	3
Manchester	15	—	63	—
Marlborough	5	—	41	—
New Britain	31	2	187	4
Newington[4]	19	3	72	3
Plainville	13	2	41	3
Rocky Hill	9	—	48	—
Simsbury[4]	18	2	98	2
Southington[6]	33	4	230	9
South Windsor	11	—	69	—
Suffield[7]	23	3	86	7
West Hartford[8]	35	4	147	6
Wethersfield	17	—	88	—
Windsor[2]	33	6	149	11
Windsor Locks[4]	6	1	30	1
	506	43	2,512	65
Tolland County				
Andover	2	—	3	—
Bolton	1	—	1	—
Columbia	12	—	93	—
Coventry	26	2	134	3
Ellington	12	—	45	—
Hebron	10	1	50	1
Mansfield	20	1	96	2
Somers	6	—	29	—
Stafford	13	3	35	4
Tolland	11	—	48	—
Vernon	9	—	50	—
	122	7	584	10

[2]Three apiaries inspected twice.
[4]One apiary inspected twice.
[6]One apiary inspected three times.
[7]Two apiaries inspected twice.
[8]Four apiaries inspected twice.

TABLE 3—Concluded

Town	Apiaries Inspected	Apiaries Diseased (Am. f. b.)	Colonies Inspected	Colonies Diseased (Am. f. b.)
Windham County				
Ashford	14	1	36	1
Brooklyn	7	2	106	2
Canterbury	5	—	39	—
Chaplin	1	—	1	—
Eastford	4	—	13	—
Hampton	12	—	59	—
Killingly	13	—	35	—
Plainfield	17	1	125	1
Pomfret	16	—	69	—
Putnam	8	—	33	—
Scotland	14	—	75	—
Thompson	18	—	80	—
Windham[4]	20	7	101	13
Woodstock	20	—	78	—
	169	11	850	17

[4]One apiary inspected twice.

SUMMARY

County	Number of towns	Apiaries Inspected	Apiaries Diseased (Am. f. b.)	Colonies Inspected	Colonies Diseased (Am. f. b.)
Fairfield[1,2]	19	133	12	1,120	21
New Haven[1,2]	21	106	11	1,040	14
Middlesex[1,2]	15	106	0	935	0
New London[1,2]	21	150	8	1,709	17
Litchfield[1,3]	26	317	29	1,955	55
Hartford[1,3]	28	506	43	2,512	65
Tolland	11	122	7	584	10
Windham[1]	14	169	11	850	17
	155	1,609	121	10,705	199

[1]Fairfield County, three apiaries inspected twice; New Haven County, one apiary inspected twice; Middlesex County, one apiary inspected twice; New London County, two apiaries inspected twice; Litchfield County, 10 apiaries inspected twice; Hartford County, 18 apiaries inspected twice; Windham County, one apiary inspected twice.

[2]Fairfield County, two colonies sacbrood; New Haven County, three colonies sacbrood; Middlesex County, seven colonies sacbrood; New London County, one colony sacbrood.

[3]Litchfield County, two apiaries inspected three times; Hartford County, two apiaries inspected three times.

	Apiaries	Colonies
Inspected, 1938	1,609	10,705
Infected with American foul brood	121	199
Percentage infected	7.5	1.9
Colonies treated		11
Colonies destroyed		188
Av. no. of colonies per apiary		6.7
Av. cost of inspection	$1.18	$.177
Total cost of inspection for 1938	$1,901.45	

Financial Statement

January 1, 1938—June 30, 1938

Appropriation for year July 1, 1937 to June 30, 1938		$2,110.00
RECEIPTS		
Balance on hand January 1, 1938		$951.92
DISBURSEMENTS		
Salaries	$453.00	
Travel (outlying investigations)	365.75	
Total Disbursements		818.75
Balance on hand July 1, 1938		$133.17[1]

July 1, 1938—December 31, 1938

RECEIPTS		
Appropriation for year July 1, 1938 to June 30, 1939		$2,110.00
DISBURSEMENTS		
Salaries	$624.00	
Travel (outlying investigations)	449.70	
Supplies	9.00	
Total Disbursements		1,082.70
Balance on hand January 1, 1939		$1,027.30
Total disbursements for 1938		$1,901.45

Registration of Bees

Section 2129 of the General Statutes provides that each beekeeper shall register his bees on or before October 1 of each year with the town clerk of the town in which the bees are kept, and that each town clerk, on or before December 1, shall report to the State Entomologist whether or not any bees have been registered, and if so, shall send a list of the names and number of colonies belonging to each. In 1938, 1,609 apiaries, containing 10,705 colonies were inspected. There were registered 934 apiaries and 5,913 colonies in 1938, and after checking the registrations and inspections, and deducting the duplications, the following figures show that at least this number of apiaries and colonies were kept in Connecticut in 1938:

	Apiaries	Colonies
Inspected	1,609	10,705
Registered but not inspected	443	1,786
Total	2,052	12,491

[1]Reverted to State Treasury.

REPORT ON CONTROL OF THE GYPSY MOTH, 1938

W. E. Britton, J. T. Ashworth and O. B. Cooke

During the 1937-1938 scouting season, gypsy moth control work has been carried on by the regular state force, under the immediate supervision of Mr. J. T. Ashworth, in much the same manner as it has been for years past and in coöperation with the Federal Bureau of Entomology and Plant Quarantine. As usual, the work of the Federal Bureau was confined to the western section of this State in what is known as the "Barrier Zone". In the central and eastern parts of the State, gypsy moth control work was carried on by details of men from the CCC camps located in or near these sections. The regular state organization for the suppression of the gypsy moth did control work in Windham, New London, Tolland, Hartford and Litchfield counties, the greater part of the work being carried on in the section east of the Connecticut River.

The writers here express their gratitude and thanks for the continued friendly coöperation of Mr. A. F. Burgess, who has general supervision of Gypsy and Brown-tail Moth Control for the Bureau of Entomology and Plant Quarantine; Mr. H. L. Blaisdell, in charge of field work, under Mr. Burgess; Mr. S. S. Crossman, under whose direction gypsy moth control work was carried on in the various CCC camps in the central part of Connecticut; and to Mr. A. F. Hawes, State Forester, who has general supervision of the CCC camps.

New Equipment

There were no large purchases of new equipment made during the past season. The usual number of small wrenches and other tools that had become worn out or broken were replaced.

Control Operations

Following is a brief yearly report of gypsy moth control operations carried on by the different agencies.

Work Performed by State Men

The regular state gypsy moth crews operated in Windham, New London, Tolland, Hartford and Litchfield counties.

Windham County: Scouting work was performed in the towns of Brooklyn, Pomfret, Putnam, and Woodstock, gypsy moth infestations being found in all the towns. One previously infested area in the town of Killingly was visited during the larval season and caterpillars were found to be present. Due to the lateness in the season it was impossible to do any further work in this county this past year.

New London County: During the past season, scouting work was performed in the following towns: East Lyme, Groton, Lebanon, Montville, New London, and Waterford and infestations were found in all the towns visited. During the larval season the towns of Norwich, Salem, and Stonington were visited, caterpillars being found at all points visited

in the towns of Norwich and Stonington. In Salem, previously known infested areas were visited and no trace of gypsy moth caterpillars was found. Spraying was done in the towns of East Lyme and Norwich during the month of June.

Tolland County: During the past year, state crews visited seven towns in Tolland County. These towns were Bolton, Columbia, Coventry, Mansfield, Stafford, Tolland, and Vernon. While scouting, gypsy moth infestations were found in all the towns visited. During the larval season all of the towns, with the exception of Tolland, were visited, caterpillars being found at all the points visited. During the month of June, spraying operations were carried on in the town of Vernon.

Hartford County: A large amount of control work was done in this county during the scouting season. State men performed work in the towns of Avon, Bloomfield, Burlington, East Granby, Enfield, Farmington, Glastonbury, Granby, Hartford, New Britain, Simsbury, Suffield, West Hartford, and Windsor. Gypsy moth infestations were found in all the towns visited, with the exception of Burlington, Glastonbury, Hartford, and New Britain. Scouting in these four towns was confined to the area around previously known infested trees, with no re-infestation being discovered. During the larval season, infestations in the towns of Bloomfield, East Granby, Enfield, Farmington, Granby, Suffield, West Hartford, and Windsor were patrolled, caterpillars being found at all points visited. During the spraying season, in June, spraying operations were carried on in the towns of Avon, Bloomfield, Farmington, and West Hartford.

Litchfield County: In this county, Harwinton was the only town visited by a state crew during the season. While scouting, gypsy moth infestations were discovered in the town, and during the larval season these infested areas were patrolled. Caterpillars were found at all the points visited. Spraying operations were carried on in this town during the month of June.

During the past season, state men scouted 379 miles of roadside and 10,248 acres of open and wooded country, destroyed 29,505 egg-clusters and 18,503 larvae and pupae, applied 16,613 bands to trees in and around infested areas, and used 9,870 pounds of arsenate of lead during spraying operations.

Work Performed by CCC Men

During the past scouting season, details of men from the various CCC camps, located in the central and eastern sections of the State, were engaged in gypsy moth control work in the form of scouting, cleaning and cutting infested areas, banding, and patrolling for larvae. These CCC details carried on this work in 41 towns in Windham, New London, Tolland, Hartford, Middlesex, New Haven, and Litchfield counties. Their efforts resulted in the destruction of 315,234 egg-clusters and 1,294,850 larvae and pupae. During the course of the year, these CCC details scouted 287 miles of roadside and 100,944 acres of open and wooded country, and applied 613,300 burlap bands to the trees in and around infested areas. The work performed by the details of CCC men from the camps in eastern

Connecticut, established in Hampton, Stafford, and Voluntown, was under the supervision of men taken from the regular state gypsy moth force.

WPA Work Performed

The Federal Bureau of Entomology and Plant Quarantine, with headquarters at Greenfield, Massachusetts, carried on a Gypsy Moth Control Project in this State, using funds made available by the Works Progress Administration. A large percentage of the men obtained for this work were taken from the relief rolls of the towns in the vicinity in which the work was carried on. Control work in the form of scouting, banding, cleaning and spraying was carried on in 29 towns in Hartford, Middlesex, New Haven, Litchfield, and Fairfield counties. During the past season these WPA men scouted 1,036 miles of roadside and 232,700 acres of open and wooded country and destroyed 16,191 egg-clusters and 15,481 larvae and pupae. They applied 146,720 burlap bands to trees in and around known infested areas, and in the spraying season an intensive program was carried on, during the operation of which 132,653 pounds of arsenate of lead were used.

Farm Security Administration Project

The Farm Security Administration, formerly the Resettlement Administration, carried on a Gypsy Moth Control Project, on their own properties in Griswold and Voluntown, during the period from January to July, 1938. The gypsy moth scouting crew inspected 2,020 acres of woodland and destroyed 1,188 egg-clusters. During the larval season the men patrolled these infested areas and destroyed 2,554 larvae and pupae. This work was carried on under the supervision of Mr. Ashworth.

The following pages show the statistics of gypsy moth suppression operations of all these agencies, with summary on page 48.

TABLE 4. STATISTICS OF INFESTATIONS, 1937-1938

Towns	Infestations found	Egg-clusters creosoted	Number colonies sprayed	Lbs. lead used	Larvae, pupae crushed	Bands applied	Miles scouted	Acres scouted	Acres cleaned
Windham County									
Ashford[2]	1	231	0	0	0	0	0	14	0
Brooklyn[1]	4	7,668	0	0	3,770	656	2	33	0
Eastford[2]	0	0	0	0	0	0	4	0	0
Killingly[1]	0	0	0	0	2	0	0	0	0
Plainfield[2]	17	6,512	0	0	56,560	3,813	0	1,949	0
Pomfret[5]	1	528	0	0	64	0	0	14	0
Putnam[1]	1	273	0	0	1,526	286	0	1	0
Sterling[2]	21	7,987	0	0	28,282	2,979	0	1,343	0
Woodstock[5]	5	263,818	0	0	879,765	10,525	11	229	8
	50	287,017	0	0	969,969	18,259	17	3,583	8
New London County									
East Lyme[1]	9	986	7	3,406	761	569	110	2,200	0
Griswold[4]	5	1,101	0	0	2,554	0	0	1,090	0
Groton[1]	1	424	0	0	379	0	2	21	0
Lebanon[1]	5	3,889	0	0	40	0	1	842	0
Montville[1]	4	121	0	0	1,236	3,255	0	514	0
New London[1]	3	3,182	0	0	26	0	27	0	0
North Stonington[2]	17	5,590	0	0	32,880	565	0	6,732	0
Norwich[1]	0	0	2	40	222	0	1	5	0
Salem[1]	0	0	0	0	0	0	0	9	0
Stonington[1]	0	0	0	0	157	0	0	0	0
Voluntown[9]	10	3,398	0	0	582	1,844	0	1,554	0
Waterford[1]	2	32	0	0	1,353	384	62	0	0
	56	18,723	9	3,446	40,190	6,617	203	12,967	0

Footnotes after Summary.

TABLE 4. STATISTICS OF INFESTATIONS, 1937-1938—Continued

Towns	Infestations found	Egg-clusters creosoted	Number colonies sprayed	Lbs. lead used	Larvae, pupae crushed	Bands applied	Miles scouted	Acres scouted	Acres cleaned
Tolland County									
Bolton[1]	5	88	0	0	288	1,298	0	88	0
Columbia[1]	2	1,380	0	0	2,325	0	0	41	0
Coventry[1]	15	455	0	0	708	1,510	1	435	0
Ellington[2]	0	0	0	0	6,549	0	0	0	0
Mansfield[1]	3	6	0	0	0	0	0	0	0
Somers[2]	0	0	0	0	2,362	0	0	0	0
Stafford[5]	1	37	0	0	62,110	790	0	0	0
Tolland[5]	9	521	0	0	36	0	4	234	0
Union[2]	0	0	0	0	127,135	0	0	0	0
Vernon[1]	3	62	2	1,152	12	227	1	85	0
	38	2,549	2	1,152	201,525	3,825	6	883	0
Middlesex County									
Chester[2]	0	0	0	0	0	0	30	10,257	0
Cromwell[2]	0	0	0	0	0	0	40	8,472	0
Durham[2]	2	54	0	0	597	21,646	2	2,193	19
Haddam[2]	1	2	0	0	859	42,974	16	6,034	0
Middlefield[2]	1	11	0	0	65	14,785	3	653	0
Middletown[7]	4	328	0	0	3,861	79,748	6	2,360	11
	8	395	0	0	5,382	159,153	97	29,969	30
Hartford County									
Avon[1]	5	126	4	732	0	0	15	36	0
Berlin[7]	4	70	0	0	1,096	18,653	23	5,926	40
Bloomfield[1]	21	1,142	3	3,600	495	1,072	14	349	0
Burlington[5]	3	381	0	0	17,667	84,969	2	2,266	0

TABLE 4. STATISTICS OF INFESTATIONS, 1937-1938—Continued

Towns	Infestations found	Egg-clusters creosoted	Number colonies sprayed	Lbs. lead used	Larvae, pupae crushed	Bands applied	Miles scouted	Acres scouted	Acres cleaned
Hartford County—Continued									
Canton[2]	1	307	0	0	0	0	0	0	0
East Granby[1]	11	173	0	0	2,742	157	1	99	0
Enfield[5]	84	677	0	0	1,867	1,703	100	258	0
Farmington[1]	3	469	3	646	339	3,051	1	1,099	0
Glastonbury[1]	0	0	0	0	0	0	0	12	0
Granby[5]	2	16,347	0	0	38,755	0	0	1	0
Hartford[1]	0	0	0	0	0	0	1	0	0
Hartland[2]	15	575	0	0	17,393	72,757	21	8,078	11
New Britain[5]	1	21	0	0	153	4,022	16	1,808	5
Rocky Hill[2]	0	0	0	0	0	0	32	7,765	0
Simsbury[1]	15	3,018	0	0	0	0	0	803	0
Southington[2]	2	80	0	0	1,248	17,630	1	381	0
Suffield[1]	6	3,386	0	0	252	167	3	624	0
West Hartford[1]	8	326	1	90	46	380	17	1,027	0
Wethersfield[2]	1	2	0	0	529	6,024	7	1,946	0
Windsor[1]	5	59	0	0	340	1,693	4	35	0
	187	27,159	11	5,068	82,922	212,278	258	32,513	56
New Haven County									
Branford[2]	1	3	0	0	2,756	2,930	14	540	0
Cheshire[3]	0	0	0	0	0	0	32	4,952	0
Guilford[2]	2	34	0	0	768	13,526	32	12,331	9
Madison[2]	0	0	0	0	0	0	2	1,500	0
Meriden[7]	2	153	0	0	4,211	26,127	2	1,132	16
North Branford[2]	0	0	0	0	0	0	0	550	0
Orange[3]	0	0	0	0	0	0	53	9,800	0
Wallingford[3]	1	4	0	0	21	0	16	1,518	9
West Haven[3]	0	0	0	0	0	0	95	4,890	0
Wolcott[7]	1	4	0	0	150	36,351	0	5	5
	7	198	0	0	7,906	78,934	246	37,218	39

TABLE 4. STATISTICS OF INFESTATIONS, 1937-1938—Continued

Towns	Infestations found	Egg-clusters creosoted	Number colonies sprayed	Lbs. lead used	Larvae, pupae crushed	Bands applied	Miles scouted	Acres scouted	Acres cleaned
Litchfield County									
Barkhamsted[2]	15	9,837	0	0	6,178	79,382	4	5,428	17
Canaan[3]	24	12,536	7	48,084	12,974	84,088	61	21,834	479
Colebrook[2]	3	5	0	0	4	19,440	22	8,970	1
Cornwall[3]	10	1,272	4	7,440	453	11,950	35	11,214	170
Harwinton[3]	4	43	2	204	594	6,149	6	1,889	15
Kent[3]	1	27	1	9,785	0	0	14	7,428	3
Litchfield[3]	7	578	3	10,972	203	2,541	34	9,115	99
New Hartford[2]	1	11	0	0	1,151	40,921	0	268	7
New Milford[3]	0	0	0	0	0	0	31	6,530	0
Norfolk[3]	17	456	5	10,705	83	0	27	11,854	58
North Canaan[3]	2	243	2	4,540	150	0	17	5,209	0
Salisbury[3]	5	322	5	11,389	481	11,997	5	5,233	114
Sharon[3]	4	35	3	2,992	0	11,318	143	29,933	15
Torrington[2]	1	3	0	0	33	1,033	4	887	0
Warren[3]	4	708	4	26,746	1,116	24,826	41	10,550	194
Washington[3]	0	0	0	0	0	0	9	2,401	0
Watertown[3]	0	0	0	0	0	0	6	2,717	0
Winchester[2]	1	1	0	0	74	3,922	2	677	0
	99	26,077	36	132,857	23,494	297,567	461	142,137	1,172
Fairfield County									
Bethel[3]	0	0	0	0	0	0	29	5,978	0
Brookfield[3]	0	0	0	0	0	0	68	11,426	0
Easton[3]	0	0	0	0	0	0	44	12,521	0
Monroe[3]	0	0	0	0	0	0	70	13,431	0
New Fairfield[3]	0	0	0	0	0	0	48	10,473	0
Redding[3]	0	0	0	0	0	0	91	17,176	0
Sherman[3]	0	0	0	0	0	0	47	12,324	0
Trumbull[3]	0	0	0	0	0	0	17	3,313	0
	0	0	0	0	0	0	414	86,642	0

SUMMARY OF STATISTICS, 1937-1938

County	No. of towns	Infestations found	Egg-clusters creosoted	Number colonies sprayed	Lbs. lead used	Larvae, pupae crushed	Bands applied	Miles scouted	Acres scouted	Acres cleaned
Windham	9	50	287,017	0	0	969,969	18,259	17	3,583	8
New London	12	56	18,723	9	3,446	40,190	6,617	203	12,967	0
Tolland	10	38	2,549	2	1,152	201,525	3,825	6	883	0
Middlesex	6	8	395	0	0	5,382	159,153	97	29,969	30
Hartford	20	187	27,159	11	5,068	82,922	212,278	258	32,513	56
New Haven	10	7	198	0	0	7,906	78,934	246	37,218	39
Litchfield	18	99	26,077	36	132,857	23,494	297,567	461	142,137	1,172
Fairfield	8	0	0	0	0	0	0	414	86,642	0
	93	445	362,118	58	142,523	1,331,388	776,633	1,702	345,912	1,305

[1]State work
[2]CCC work
[3]USDA work
[4]FSA work
[5]State-CCC work
[6]State-USDA work
[7]USDA-CCC work
[8]State-USDA-CCC work
[9]FSA-CCC work

FINANCIAL STATEMENT

July 1, 1937—June 30, 1938

RECEIPTS

Appropriation year ending June 30, 1938	$44,880.00

DISBURSEMENTS

Personal Services:	
Salaries	$25,888.50
Labor	13,073.25
Supplies and Materials:	
Stationery and office supplies	26.31
Insecticides	918.80
Gasoline	1,012.71
Auto oil and grease	122.13
Chemicals	4.50
Lumber and small hardware	4.13
Medical supplies	12.00
Other supplies (miscellaneous)	279.42
Communication Service:	
Telephone	52.05
Postage	15.00
Travel Expenses:	
Outlying investigations	211.30
Transportation of Things:	
Freight, express and parcel post	8.48
Heat and Light:	
Fuel	30.15
Electricity	17.28
Contingent Expenses:	
Insurance	408.56
Medical services	23.00
Equipment:	
Tools, machinery and appliances (new)	16.52
Tools, machinery and appliances (repairs)	75.64
Automobiles (repairs)	252.68
Buildings and Land:	
Rent of storehouse, office space and garages	512.00
Total Disbursements	$42,964.41
Balance on hand, July 1, 1938	1,915.59[1]
	$44,880.00

Scouting for Brown-Tail Moth

There was no brown-tail moth scouting project carried on in this State during the 1937-1938 season.

[1]Reverted to State Treasury.

THE EUROPEAN CORN BORER IN 1938

W. E. Britton, M. P. Zappe and Neely Turner

Heavy infestations of European corn borer on both early and late sweet corn were common in most sections of the State. Losses in New Milford were especially large and the infestation continued at a high level in New Haven, Fairfield, Middlesex and Hartford counties. Seed corn in Milford was heavily infested and some fields showed a 50 percent loss in yield.

Early potatoes were heavily infested in Stratford and late potatoes were damaged in Hartford and Tolland counties.

Dahlias were badly damaged in all sections of the State by second-generation larvae. A field of early flowers grown commercially in Branford was heavily infested and many plants were lost.

Enforcement of the Compulsory Corn Borer Clean-Up

In compliance with Section 2125 of the General Statutes, the Director of the Connecticut Agricultural Experiment Station issued the following clean-up order for 1938:

European Corn Borer

Clean-Up Order for 1938

Pursuant to the provisions of Section 2125 of the General Statutes of Connecticut as amended by the General Assembly of 1935, I, William L. Slate, Director of the Connecticut Agricultural Experiment Station, do hereby issue orders, rules and regulations, as follows:

That throughout the entire State, on account of the European corn borer, *Pyrausta nubilalis* Hbn., all cornstalks, corn cobs, stubble, stalks of dahlia or other flowering or vegetable plants, be disposed of on or before April 25, 1938. This may be done as follows:

1. Plow under cleanly at least six inches deep.
2. Run through a stalk shredder or ensilage cutter, cutting in pieces one inch or less in length.
3. Feed to livestock and see that no litter remains nor is thrown on the manure heap.
4. Shell corn or grind cobs with corn for stock feed.
5. Burn stalks and cobs completely.
6. Screen corn cribs with material that is 14 meshes per inch or finer, to prevent escape of moths that may emerge from cocoons in the cobs.

(signed) W. L. Slate,
February 28, 1938 Director

On April 25, eleven inspectors started work on this project. They were assigned to towns in which the largest amount of corn is grown and where the corn borer was expected to be abundant. Most of these towns were along the shore of Long Island Sound and the Housatonic, Connecticut and Thames rivers.

The men were instructed to look for fields of cornstalks, corn stubble, and cornstalks in pastures and barns. They were also to watch for corn

on the cob stored in corn cribs and to see that these were properly screened to prevent the escape of moths emerging from cobs in the cribs.

In most cases violators of the corn borer clean-up law were reported to the law enforcement authorities in the towns where violations occurred. In a majority of the cases the town prosecutors were able to persuade people to clean up their premises without resorting to arrests and court proceedings. In a few instances it was necessary to arrest the violators and fine them for failing to comply with the regulations. Seven landowners were arrested and fined, and many cases were settled out of court. As a rule people who had been notified by the town authorities to clean up were given a few additional days to finish this work. If they complied within the specified time, the case was dropped. The prosecuting attorneys depended upon our inspectors to make a final inspection in these cases, and this increased the work and travel for our men.

The work was finished by June 1, as moths began to emerge a few days prior to this date and it was no longer of any use to continue. A majority of the farmers had their plowing completed by this time.

Most of the troubles encountered were with owners who had rented their land to other parties for the purpose of growing corn. The tenant usually neglects to plow under the corn stubble and frequently the stalks are left on the land as well. The owner always feels that the planter of the corn should clean up the field, but frequently the tenant leaves or his lease expires at the end of the growing season and it is difficult to get him to do anything. If neither landowner nor tenant cleans up, we must hold the owner responsible unless there is a written lease between owner and tenant and the lease is still in force, in which case we can hold the tenant responsible. Another source of trouble is the out-of-state owners of untenanted farms upon which corn has been grown the preceding year. Much time is lost getting in touch with the owners who must, in turn, find someone to do the work for them. It thus happens frequently that some moths emerge from remnants of the corn crop before the clean-up is completed.

A total of 83 towns were inspected. The inspectors used their private automobiles for which they were allowed remuneration on a mileage basis. Altogether the inspectors traveled 18,000 miles on this work. The total cost of mileage, salaries and other expenses amounted to $2,412.08.

Insecticide Investigations

These investigations were conducted in coöperation with the Federal Bureau of Entomology and Plant Quarantine, Division of Cereal and Forage Insects. In 1938, experiments were conducted to determine the possibility of decreasing the cost of sprays and dusts by reducing the number of applications.

The standard schedule for extra early corn infested by the first generation of the European corn borer has been four applications at five-day intervals, starting when the eggs first hatch. Five modifications of this schedule were tried on early sweet corn in 1938.

The corn was planted May 2, eggs were found on June 1 and first hatching occurred June 10. The standard schedule was set up as June 15, 20, 25 and 30 because few eggs hatched before June 14. Rain interfered with the schedule from June 26 to 29, but apparently had no serious effects on the experiment. Commercial dual-fixed nicotine dust (3.75 percent nicotine) was used in all tests and applied with a bellows-type hand duster. The results are given in Table 5, which shows that none of the modified schedules was as effective as the standard. However, only the schedule of the two applications at weekly intervals starting early was less effective than the other treatments, especially in percent reduction of borers.

TABLE 5. SCHEDULE TESTS—FIRST GENERATION CORN BORER

Applications	Dates	% reduction of borers	% No. 1 borer-free ears
1. Standard schedule	June 15, 20, 25, July 1	71.7	78.5
2. Three at weekly intervals	June 15, 22, 29	60.6	69.0
3. Three: starting later than standard	June 17, 22, 29	59.5	76.8
4. Three: omitting first from standard	June 20, 25, July 1	64.4	73.7
5. Two at weekly intervals starting early	June 15, 22	43.2	67.1
6. Two at weekly intervals starting late	June 20, 29	61.6	72.9
7. No treatment			50.0

Tests on the second-generation larvae were made on corn planted July 6. The first eggs were found on August 1 and hatching started August 5. The standard schedule of five applications was established as August 8, 13, 18, 23 and 28, and four modified schedules were tried. Rain interfered with only the first application. Commercial dual-fixed nicotine dust was applied by hand in these tests. The results are given in Table 6, which shows that the standard schedule was more effective than any modification. Four applications at weekly intervals produced a satisfactory reduction in borers, but the percentage of borer-free ears was unexpectedly low.

Since these tests have been conducted for only one season, no conclusions can be drawn as yet. However, in both generations there is at least an indication that it may be possible to adopt a schedule with less than the standard number of applications.

It will be noted that the results of the second generation dust schedule were highly satisfactory. The standard treatment produced 70 percent borer-free ears as compared with only 18.5 percent borer-free ears on untreated plots.

TABLE 6. SCHEDULE TESTS—SECOND GENERATION CORN BORER

Schedule	Dates	% reduction in borers	% No. 1 borer-free ears
1. Standard	Aug. 8, 13, 18, 23, 28	85.8	70.2
2. Four at weekly intervals	Aug. 8, 15, 22, 29	81.1	60.2
3. Four: first standard omitted	Aug. 13, 18, 23, 28	75.9	55.1
4. Four at weekly intervals starting late	Aug. 13, 20, 27, Sept. 3	80.4	54.2
5. Three at weekly intervals starting early	Aug. 8, 15, 22	77.8	67.0
6. No treatment			18.5

JAPANESE BEETLE WORK IN CONNECTICUT, 1938

J. P. JOHNSON

Scouting

SEASONAL scouting for the adult Japanese beetle began on July 11. A total of five crews, each consisting of one foreman and three scouts, reported for work at the Connecticut Agricultural Experiment Station, and were given one day of schooling in the methods of scouting for Japanese beetles. Five one-half ton canopy trucks were furnished for transportation by the U. S. Department of Agriculture. On the morning of July 12, two of the crews which were under the supervision of the New Haven office began scouting nurseries and greenhouses in their respective districts. They finished on September 8. The other three crews, operated under the supervision of Mr. H. N. Bartley of the Federal Japanese Beetle Office, Boston, Mass.[1], proceeded to their respective bases on the evening of July 11 and began scouting the nurseries and greenhouses in their districts on July 12. They completed the work on September 9. The crews were stationed at Hartford, Middletown, New Haven, Shelton, and Storrs, and were paid with federal funds.

As in past seasons, each crew followed an itinerary and scouted classified nursery and greenhouse establishments, their subdivisions and others desiring classification, five to six times. Altogether there were 84 establishments, comprising 144 growing units, scouted within the State. The minimum distance examined around each unit was 1,000 feet. In addition, the men scouted, from one to six times each, the premises of 125 dealers in sand, soil, peat and manure, 1 orchard establishment, and 12 woodland areas. Two hundred and eighty-eight beetles were found on the premises of 26 nursery and greenhouse firms scouted, 185 on the premises of 15 manure sources scouted, 28 on the premises of 5 sand and soil sources scouted, and two in the orchard establishment scouted. These totaled 503 beetles. Results of the scouting in Fairfield County indicate that the numbers of beetles have continued to increase greatly in that section.

[1]U. S. Department of Agriculture, 13th Floor, Custom House, Boston, Mass.

Trapping

During the season of 1938, trapping activities were not carried on as extensively as in other seasons because a regular trapman was not employed. The two regular nursery and greenhouse inspectors set traps and checked them as often as possible in addition to their regular routine duties, as follows: Twenty-five traps were placed in Bethel; 15 in Colchester; 4 in Cromwell; 25 in Derby; 25 in Rocky Hill; 25 in Seymour, and 25 in Trumbull.

The table below lists the number of beetles captured in the towns for the first time.

Table 7. Beetles Trapped

Location	Dates Found	Number of Beetles
Bethel	Aug. 5	28
Colchester	Aug. 12, 18	8
Cromwell	.....	0
Derby	July 27, 29	59
Rocky Hill	Aug. 5, 16	3
Seymour	July 29; Aug. 9	6
Trumbull	July 25, 26	127
Totals beetles trapped		231

Inspection and Certification

As in past seasons, the district inspectors were able to take care of the farm products quarantine work in addition to their regular routine duties.

Inspection points were located as follows:

Location	No. of Inspectors
New Haven	2
[1]Manchester	1
[1]Middletown	1
[1]Westerly, R. I.	1
Total	5

Kind and amount of products certified:

Products	No. of packages
Corn	16
Beans	17
Apples	1
Peaches	2
Cut flowers	2

[1]The district inspectors in Manchester and Middletown, Conn. and Westerly, R. I. were under the supervision of the Federal Japanese Beetle Office, Boston, Mass.

The total number of plants inspected and certified for shipment to other states and foreign countries was 7,251,059, while half a carload of sand and soil was shipped to other states.

The number of certificates issued is shown below:

Table 8. Certificates Issued

Kind	Farm Products	Cut Flowers	Nursery and Ornamental Stock	Sand Soil	Manure	Total
"A"	21	2	50,390	3	0	50,416
"B"	0	0	6,551	18	16	6,585
Total	21	2	56,941	21	16	57,001

General Japanese Beetle Survey

Observations were made during the summer months of 1938 to determine the condition of the infestations where beetles had been present for a number of years. The increase in the number of adult beetles and the resulting damage to host plants were greater than in 1937. General increases occurred in Bridgeport, East Hartford, Greenwich, Hartford, New Canaan, New Haven, Stamford and Ridgefield, while beetles were captured in numbers for the first time in the rural and semi-rural sections around Bridgeport, Greenwich, Hartford, New Haven, Stamford and Ridgefield. These towns were infested nine to twelve years ago and the infestations have increased steadily.

The Hartford infestations were much slower in developing, as originally they were treated for the grub stage of the beetle with carbon bisulfide emulsion diluted in water and later with lead arsenate. These treatments were very effective and for several years beetles were scarce throughout the areas treated.

Approximately 40 city blocks in the city of Bridgeport, north of North Avenue and east of Brooklawn Avenue, were very heavily infested. Nearly all the host plants, including elm, horsechestnut, linden, Norway maple, Schwedleri maple, willow, apple, plum, mountain ash, purple leaf plum, white birch, sweet and sour cherry, roses, grapevines, zinnia, hollyhock, Virginia creeper, sassafras and others, were attacked vigorously by the adult beetles. Many shade trees, vines, shrubs, and annuals were completely defoliated.

The spread of the beetle from the older infestations to the surrounding rural areas was very apparent from trap records and general scouting. The urban infestations are large and the beetles so numerous that a rapid natural spread to large areas in the rural sections of the State will take place in the next few years. The infestation in the East Hartford meadows has spread northward into the South Windsor meadows and southeastward into the urban section of East Hartford.

It was reliably reported to this office that large numbers of beetles alighted on excursion boats plying between Connecticut and New York, in the western end of Long Island Sound. Fishing parties off the western part of the Connecticut shore were annoyed by them on sunny days, and sails had to be shaken free of beetles before stowing. The metropolitan area of New York City and Westchester County are heavily infested and flights of beetles occurred on sunny days. Several flights were over Long Island Sound. Such flights are conducive to the rapid spread of the insect to the surrounding areas.

Beetles were found in the towns of Bethel, Colchester, Derby, North Branford, Old Lyme, Rocky Hill, Seymour, South Windsor, Trumbull, Vernon, and Wilton, for the first time. This increases the total to 73 towns in Connecticut now known to be infested.

Grub Survey and Parasites

Diggings (one square foot in area, 12 to 18 inches deep) were made on the sites of the old infestations to determine the grub population in the soil. The results of these diggings are given in Table 9.

TABLE 9

Location	No. of holes	No. of grubs	Av.
	SPRING, 1938		
Bridgeport	7	85	12.1
Greenwich	4	42	10.5
Hamden	4	41	10.2
Hartford	4	51	12.7
Norwich	3	22	7.3
Stamford	6	13	2.1
Totals	28	254	9.1
	FALL, 1938		
Bridgeport	29	370	12.7
East Hartford	4	81	20.2
Fairfield	3	20	6.6
Fair Haven	8	111	13.8
Greenwich	24	173	7.2
Hartford	2	19	9.1
Hamden	4	28	7.0
Meriden	4	10	2.5
Montowese	1	10	10.0
New Haven	3	5	1.6
New London	3	72	24.0
Stamford	4	45	11.2
Stratford	1	3	3.0
South Windsor	1	5	5.0
West Haven	2	6	3.0
Totals	93	958	10.3

The information obtained by the grub diggings was used as a basis for releasing the grub parasites, *Tiphia vernalis*, Roh., and *Tiphia popilliavora*, Roh., by the United States Department of Agriculture, Bureau of Entomology and Plant Quarantine. Fifteen colonies of *T. vernalis* were released in the spring of 1938, and 18 colonies of *T. popilliavora* in the early fall of 1938. The number of colonies of parasites released in Connecticut from 1936 to 1938, inclusive, now totals 23 of *T. vernalis*, 24 of *T. popilliavora*, and three of *Centeter cinerea*, Aldrich.

Further information on these parasites will be found under Dr. Garman's "Report on Parasite Work, 1938" in this bulletin.

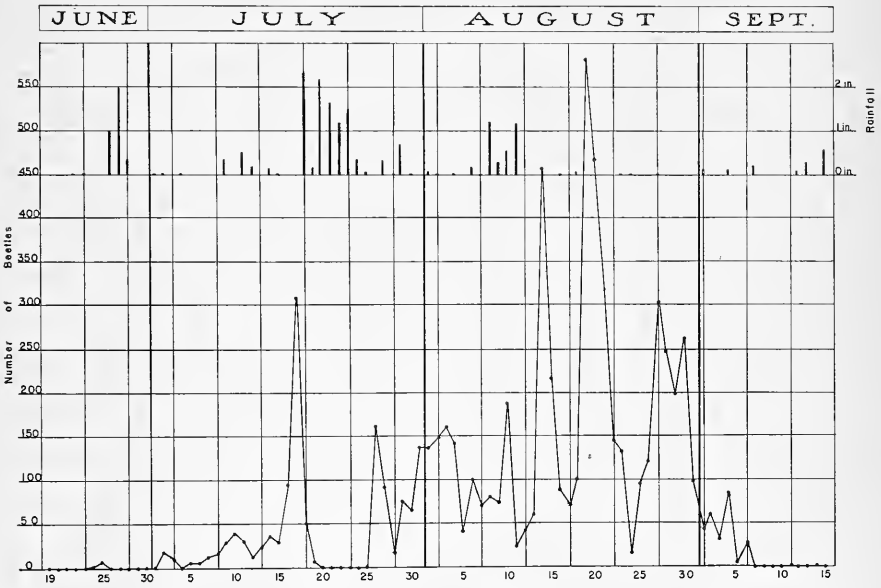

FIGURE 2. Chart showing adult Japanese beetle populations in Hartford, trap record.

Adult Japanese Beetle Populations

The regular trap collections to obtain information on the relative abundance of beetles were made again during the past summer season. These collections were made in Hartford and Putnam. Through the coöperation of the Hartford Park Department, the beetles captured in the trap at Hartford were removed daily. They were collected once a week and recorded by Mr. George Smith of the Experiment Station. Mr. J. A. McEvoy, of the Connecticut Gypsy Moth Control Office, Danielson, made daily collections of the beetles captured in the trap at Putnam. He also collected by hand daily all beetles seen in the immediate vicinity of the trap. The record of the systematic hand collections in Putnam was incorporated on the chart together with the trap records, as the numbers of the beetles captured daily in the trap were very small. The charts recording the beetle collections were prepared by Mr. George Smith.

The beetle was most active during late July and August. The first peak of beetle abundance occurred in both localities about July 15. A second peak of abundance occurred in Hartford about August 20, while the Putnam chart indicates that it took place there somewhat earlier. Another peak of abundance occurred again just prior to September 1. This last peak has occurred during the last three years and was recorded graphically in the report for 1937. Figures 2 and 3 give the data graphically for 1938.

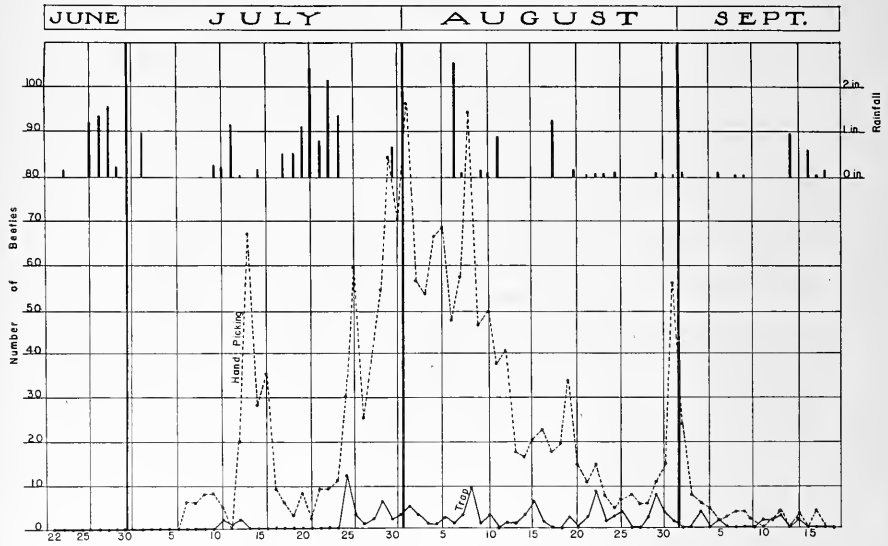

FIGURE 3. Chart showing adult Japanese beetle populations in Putnam, trap and hand-picking records.

PRESENT STATUS OF MOSQUITO CONTROL WORK IN CONNECTICUT, 1938

R. C. BOTSFORD

THE season of 1938 was favorable for the production of mosquitoes, and in many parts of the State they were reported as severe pests. Rainfall in June was above normal, and rain occurred nearly every day from July 10 to July 30. As a result, many mosquito breeding pools developed and were kept flooded. In normal seasons natural drainage or evaporation would have removed the water from these and destroyed the mosquito larvae before they emerged as adults.

The presence of *Aëdes sollicitans*, the banded salt marsh mosquito, in some towns was an indication that the ditching system in the salt marsh area was inadequate, due to either lack of maintenance or unusual weather conditions, or to a combination of both.

An average force of 10 men comprised the maintenance crews for the state-accepted salt marsh areas, totaling about 11,000 acres.

In the town of Fairfield, the officials assigned four to eight men to assist the state crew in maintaining the local areas. The Stonington-Groton area was patrolled by Mr. Noyes Farnell, hired to fill the vacancy left by the death of Mr. Irving White. The town of Stonington furnished a man to assist, which allowed some emergency oiling to be done. This resulted in very satisfactory control work.

Mr. C. F. Johnson, foreman in the New Haven County area since September, 1925, passed away July 7, 1938. His employers and associates feel keenly the loss of his fine personality and untiring services.

FIGURE 4. Stone and earth dike destroyed by hurricane, Great Harbor, Guilford.

The hurricane and tidal wave of September 21, 1938, did considerable damage to the old structures in the state-maintained areas. The stone and earth dikes in Guilford at Great Harbor and Shell Beach were almost totally destroyed, and also the Great Dike in Stratford suffered several large breaks. The new structures, including tide gates, dikes, and outlets, recently constructed under the various unemployment relief agencies, were undamaged. Work in progress and uncompleted jobs were badly damaged.

Water standing in cavities caused by uprooted trees may be the source of a mosquito nuisance in some communities. Fallen trees should be cut off and the roots tipped back into the holes. Various receptacles distributed by the hurricane should be collected and destroyed.

Many of the WPA mosquito control projects sponsored by the Station were completed and others were transferred to local town sponsorship. The following résumé indicates work in progress unless otherwise noted, and is a continuation of last season's report:

Ansonia: Cleaning Beaver Brook. Transferred to Town sponsorship.

Branford: Construction of new tide gate and sod dike at Stony Creek. Station sponsored.

East Hartford: Grading Pewter Pot Brook. Station sponsored.

East Haven: Walling of Tuttle Brook near Burr Street completed.

East Lyme: Installation of two 36-inch pipe lines at Rocky Neck completed.
Crescent Beach job completed.

Fairfield: Tide gate and pipe lines at Fairfield Beach completed.
Gould Manor ditching completed.
Ash Creek Park drainage and outlet under construction. Town sponsored.
Meadow Brook, laying 48-inch pipe and constructing junction manhole. Town sponsored.

Groton: Wild Cat Swamp work completed.
Lake George job reopened for sloping ditch banks. Station sponsored.

Guilford: Indian Cove pipe line completed.
Great Harbor jetty and dike not started.

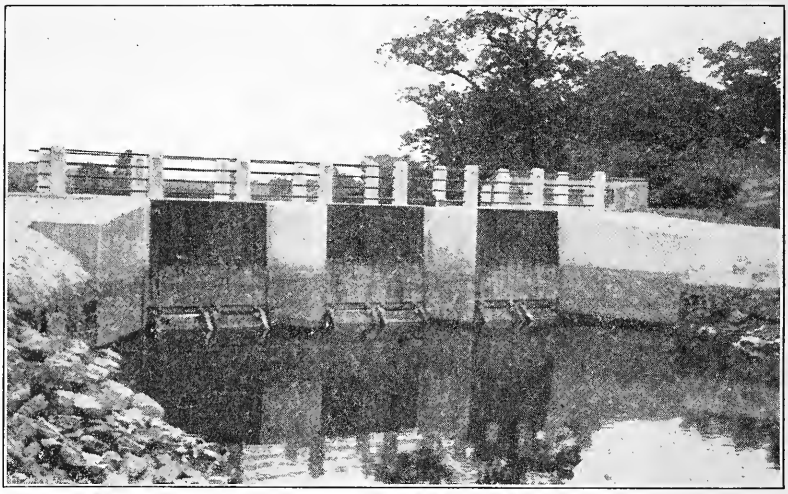

FIGURE 5. New tide gate at Morris Cove, New Haven.

Madison: Bailey Brook grading completed.
Country Club pipe line completed.
Outlet at Doctor Rindge's property completed.
Outlet at Madison Yacht Club under construction. Town sponsored.

Manchester: Boggy Stowe completed.

Milford: Point Beach pipe line completed.

New Haven: Morris Creek tide gate completed.
Beaver Park lagoon, correcting inlet completed.
Grading West River under construction. City sponsored.

North Haven: Miscellaneous swamp drainage and stream grading. Station sponsored.

Norwalk: Wilson Point completed.
General drainage near Emerson Street. Town sponsored.

Southington: Eden Avenue swamp filled. Completed.
Holcomb School swamp. Town sponsored.

Stratford: Outlet at Filter Bed completed.
Great dike repairs. Station sponsored.

West Haven: Oldfield Creek outlet, tide gate and ditch at Beach Street completed.

New culverts at Peck and Washington Avenues completed. All town sponsored.

Westport: Town dump and vicinity drainage. Town sponsored.

New projects have been started in Hamden, Danbury, New Britain, Bristol, and Plymouth, all of which are sponsored locally.

The following is a statistical record of work sponsored by the Connecticut Agricultural Experiment Station, taken from official WPA reports.

SUMMARY OF COSTS BY ITEMS OF WORK,
JANUARY 4, 1936, TO NOVEMBER 1, 1938

Item	Quantity	Unit	Unit cost	Amount
Excavation, earth, including necessary sheathing & pumping	249,963	Cubic yard	$1.66	$413,739.27
Excavation, rock, includes blasting	10,716	Cubic yard	3.82	40,945.56
Excavation (Drag line shovel)	8,940	Cubic yard	.26	2,330.17
Grading and fill	143,920	Cubic yard	1.29	185,075.64
Backfill (Bulldozer)	6,401	Cubic yard	.11	688.50
Backfill (Drag line shovel)	3,007	Cubic yard	.21	619.50
Ditching, equiv. 1′ x 2′	2,727,588	Linear foot	.06	164,676.24
Recutting ditches	1,207,722	Linear foot	.02	21,557.71
Dike construction	22,093	Cubic yard	4.85	107,116.99
Repairing wall	848	Cubic yard	.44	373.53
Pipe installation	27,607	Linear foot	2.36	65,194.33
Culvert installation	1,095	Linear foot	4.15	4,542.82
Brush removal	329	Acres	103.58	34,078.30
Sodding banks	30,119	Square foot	.12	3,650.81
Paving	5,838	Square foot	.87	5,088.87
Bulkhead installation	9,352	Square foot	.45	4,246.45
Catch basins	13	Each	90.56	1,177.32
Manholes, sewer	54	Each	235.97	12,742.20
Manholes, tide gate	23	Each	1,443.77	33,206.82
Tidegate construction (Branford River)				4,200.19
Tidegate construction (Stony Creek)				7,169.29
Tidegate construction (Morris Creek)				32,269.83
Tide gate, pipe (Stratford)	7	Each	503.37	3,525.00
Concrete cross-ties	18	Each	11.72	211.03
Masonry, rubblestone	16,722	Cubic yard	8.97	150,049.64
Headwall	1,028	Cubic yard	17.71	18,206.63
Control gates				538.01
Carpentry				7,957.29
Cofferdams				41,801.15
Culvert and tide gate demolition				4,058.30
River bank, Burr Street, East Haven				8,581.79
Other costs, including preparation of sites, handling materials, etc.				170,893.02
Direct supervision				75,043.60
Overhead costs				190,761.63
Total Costs				$1,816,317.43

SUMMARY OF TOTAL COSTS BY TOWNS,
JANUARY 4, 1936, TO NOVEMBER 1, 1938

Town	Job	Total	Grand Total
Ansonia	Nelson Estate	$3,282.10	
"	Westfield Avenue	35,379.45	
"	Beaver Brook	19,595.23	$58,256.78
Branford	Stony Creek	38,297.17	
"	Branford River	4,721.08	43,018.25
Derby	Derby Meadows		28,760.95
East Hartford	Bottom Lands	253,331.87	
" "	Pewter Pot Brook	12,880.51	266,212.38
East Haven	Bradford Cove		7,202.57
East Lyme	Rocky Neck	26,044.84	
" "	Crescent Beach	5,993.84	32,038.68
Essex	Great Meadows	5,976.85	
"	South Cove Brook	600.90	
"	Wright's Meadow	195.54	
"	Valley Farm	90.54	
"	Mud Brook	166.61	7,030.44
Fairfield	Ash Creek Park	6,873.04	
"	Honey Pot Creek	17,338.95	
"	Meadow Brook	940.45	
"	Lovers Lane	458.04	
"	Frank Street	346.15	
"	Fairfield Beach	43,523.29	
"	State Street Extension	1,191.40	
"	Gould Manor	19,269.69	89,941.01
Greenwich	Electrolux	6,835.61	
"	Decatur Street	2,490.53	
"	St. Catherine's Church	3,261.91	
"	Sunshine Park	558.48	
"	Strickland Brook	1,840.91	
"	West End Avenue	335.10	
"	Todd's Point	1,274.76	
"	Greenway's (Cos Cob)	815.40	
"	Wiley's Swamp (Cos Cob)	222.90	
"	Miscellaneous Ditching	2,288.46	19,924.06
Groton	Groton Long Point	5,633.66	
"	Bluff Point	2,557.45	
"	Bakers Cove	325.43	
"	Lake George	3,739.07	
"	Wildcat Swamp	34,266.13	46,521.74
Sub-total			$598,906.86

Town	Job	Total	Grand Total
Brought Forward			$598,906.86
Guilford	Indian Cove	$15,460.53	
"	Sachems Head	4,220.40	
"	Vineyard Point Marsh	408.14	
"	Mulberry Point	342.48	
"	Great Harbor	77.73	
"	East Creek	305.69	20,814.97
Madison	Fence Creek	1,723.59	
"	Tuxis Brook	4,583.71	
"	Bailey Brook	1,954.93	
"	Route No. 1 Tide Gate	1,061.53	
"	Country Club	12,326.23	21,649.99
Manchester	Boggy Stowe	42,466.87	
"	North Elm Street	4,427.76	46,894.63
Milford	Point Beach	31,648.51	
"	Calf Pen	1,102.90	32,751.41
New Haven	Tuttle Brook	4,119.75	
" "	Morris Creek	21,776.62	
" "	Fort Hale Extension	7,810.08	
" "	Hemmingway Pond	2,225.43	
" "	Morris Creek Tide Gate	64,948.78	
" "	Goffe Street	1,268.21	
" "	Burr Street	10,574.17	
" "	Lighthouse Point	1,027.86	113,750.90
North Haven	Quinnipiac River		40,938.09
Norwalk	Wilson Point	52,201.03	
"	Raymond River	5,004.24	
"	George Street Drain	431.94	
"	Harbor Islands	450.07	
"	Manresa Marsh	2,062.35	
"	Nash Engineering	645.98 61.93	
"	Goldstein Place	9,724.15	70,581.69
Old Lyme	Point of Woods	10,069.27	
" "	White Sands Beach	5,254.63	15,323.90
Old Saybrook	Depot Meadows	821.97	
" "	Oyster River	4,964.32	
" "	Connecticut River Bridge Meadow	277.61	
" "	Ragged Rock	481.37	
" "	Ayers Point	280.28	
" "	Fenwick	37.17	
" "	Knowlwood	80.30	
" "	Miscellaneous ditches	3,033.31	
" "	Chaulker Beach	9,288.31	
" "	Dr. Botsford's	3,858.83	23,123.47
Sub-total			$984,735.91

Town	Job	Total	Grand Total
Brought Forward			$984,735.91
Shelton	Burying Ground Brook and Fen's Pond		38,485.55
Southington	Quinnipiac River	53,012.64	
"	Kelley's Pond	11,055.46	64,068.10
Stamford	Southfield Point		5,699.68
Stratford	Great Meadows	215,359.49	
"	Long Beach	30,231.87	
"	Surf Avenue	26,813.38	
"	Long Brook	65,492.00	
"	Sniffin's Meadow	35,914.83	
"	F. C. Beach Marsh	20,763.52	
"	Filter Bed	90,202.20	
"	Frog Pond	44,443.94	
"	Ryan's Meadow	1,133.75	530,354.98
West Haven	Cove River	55,741.05	
" "	Oldfield Creek	42,072.50	
" "	Peck Avenue	20,380.83	
" "	Club and Causeway Creeks	6,746.11	
" "	Washington Avenue	18,258.35	143,198.84
Westport	Town Dump	3,094.08	
"	Minute Man Statute	45,445.13	
"	Greens Farms Brook	1,235.16	49,774.37
Total			$1,816,317.43

REPORT ON PARASITE WORK, 1938

PHILIP GARMAN

PARASITE work during 1938 was divided into four major activities: (1) parasite production to combat the Oriental fruit moth, in coöperation with the Connecticut Pomological Society; (2) experimental liberation of fruit moth egg parasites followed by recovery collections and examination of fruit at harvest; (3) general recovery collections in different parts of the State to determine which parasites are most effective; (4) location of suitable places for liberation of Japanese beetle parasites, and coöperation with the U. S. Bureau of Entomology for liberating colonies of various species.

The work has been carried on, as heretofore, by Messrs. J. C. Schread, W. T. Brigham and G. R. Smith.

Oriental Fruit Moth Parasites

Production of fruit moth parasites proceeded as usual, the plan during 1938 being to produce for sale mainly larval parasites such as *Macrocentrus ancylivorus*, *Bassus diversus* and *Orgilus longiceps*. In addition, Trichogramma were reared for experimental liberations, and the pupal parasite, *Phaeogenes haeussleri*, was reared for general distribution.

Owing to the unforeseen development of *Pediculoides ventricosus* in our breeding rooms, production was greatly curtailed so that orders could not be filled as originally planned. We were able to fill most of the orders, however, with the aid of Macrocentrus colonies received through the courtesy of Professor A. I. Bourne of the Massachusetts Agricultural Experiment Station. We also substituted a few Trichogramma.

Following is a list of the parasites produced at the laboratory during 1938 for distribution to growers.

Larval parasites	
Dioctes molestae	6,974
Orgilus longiceps	6,900
Macrocentrus ancylivorus	4,670
Bassus diversus	835
Total	19,379
Pupal parasites	
Phaeogenes haeussleri	3,911
Egg parasites	
Trichogramma pretiosa	5,300,000

Production of larval parasites, as will be seen from the above, was only about one-third that of 1937 due to the presence of Pediculoides mites. These mites increase rapidly in the breeding pans, attach them-

selves to larvae of the Oriental fruit moth, and kill them. They also destroy the parasites so that the number actually reared, both of the host and its parasite, declines rapidly unless drastic measures are taken to control the mite. Our measures consisted of removing infested stock, washing down the walls with hot water, sterilizing breeding pans and covers with hot water, fumigating the rooms with burning sulfur, and sterilizing the incubators with heat. In spite of all precautions, mites began to appear again during the fall months, but they have been kept down by destroying occasional pans and by the liberal use of dusting sulfur at certain stages. At the present time (January 15, 1939), the mites appear to be well under control.

Methods of breeding *Dioctes molestae* were studied during 1937 and 1938 by Messrs. Schread and Brigham with a view to overcoming the unfavorable sex ratio apparent in emerging adults. After changing lights, food and other factors, they came to the general conclusion that selection of breeding stock is important; also, that in crowding individuals of both sexes in small cages, there seems to be some improvement in regard to the number of females emerging. The sex ratio obtained during the period from October, 1938, to January, 1939, was: October, 36.9 percent females; November, 35.9 percent; December, 38.5 percent; and January (to January 17), 41.4 percent. These percentages are not as favorable as were obtained in 1934, but equal the best results over the five-year period. The total Dioctes reared, together with the percentage of females, is given below by years.

Year	Total reared	Percentage females
1934	3,147	48.1
1935	14,733	41.6
1936	17,616	39.6
1937	24,575	30.2
1938	23,799	33.9

Mr. Schread has reduced the breeding of *Phaeogenes haeussleri* to a more or less routine procedure and succeeded in rearing nearly 4,000 for distribution during 1938. This insect requires much tedious hand work, but the long life of the adult compensates in a way for the breeding difficulty mentioned.

Experimental liberations of Trichogramma egg parasites were made in three commercial orchards in New Haven County. The work was hindered considerably by heavy rains during June and July, so that emerging parasites were probably destroyed before they had a chance to parasitize fruit moth eggs. Check orchards were used in several different localities. A general picture of the results obtained is given in Table 10. The percentages of wormy fruit were obtained by taking random samples throughout the plots and cutting the fruit open. In the case of the controls, no percentage is given in this column because there was a natural variation from orchard to orchard. However, these orchards were no worse than plots where Trichogramma had been liberated and in some cases were better.

Table 10. Effect of Trichogramma Liberations on Oriental Fruit Moth Infestations, 1938

Orchard and location	Elbertas percent wormy	Percentage of eggs parasitized by Trichogramma	Number liberated per acre	Dates of liberation and spacing
Bishop, Cheshire	63.4	9.4	500,000	50,000 each week, June 7 to Aug. 9, 4,000 every 4th tree.
Kneuer, Guilford	44.8	10.6	200,000	66,000 monthly by fruit moth generations, 4,000 every 4th tree.
Platt, Milford	42.3	29.3	250,000	83,000 monthly by fruit moth generations, 4.000 every 2nd tree.
Check (Average of several orchards)	—	21.0	0	No liberations.

Recovery of parasites was attempted in a number of orchards both by tip and band collections. The band collections continue to show the presence of secondaries. How much significance the presence of secondaries in such collections has, cannot be stated at the present time. The twig collections continue to show an increase of larval parasites, particularly Macrocentrus, in spite of the supposed unfavorable weather during July. In New Haven and Hartford counties, the parasitism doubled in 1938 over what it had been in 1937. There appears to have been a steady increase since 1936 in this phase of parasite activity.

Attempts to recover the newer introduced species indicate that *Bassus diversus* survived over a period of two years at East Haddam and was recovered for the first time on John Tom Hill, Glastonbury, a spot where apparently others fail to survive. The most promising recovery collections of *Dioctes molestae* were made at Milford where the insect survived the winter in considerable numbers and accounted for 6.1 percent parasitized larvae in one orchard during July. In the same orchard Macrocentrus parasitized 13.2 percent during the same period. *Orgilus longiceps* was not recovered at all this year. Breeding and liberation of the species has therefore been discontinued for the present.

Japanese Beetle Parasites

Activities in this field have been confined to scouting for suitable locations, coöperation with the U. S. Bureau of Entomology in placing colonies at various points, and attempts to recover the introduced species.

During 1938, *Tiphia vernalis* and *Tiphia popilliavora* were the only species with which work was done. Localities suitable for both species were determined by grub digging, which work has been done by Messrs. Schread, Smith, Brigham, Devaux and Beecher. Colonies of *T. vernalis* were placed in the towns of Greenwich (3), Stamford (2), Danbury (1), Norwich (1), Putnam (1), East Hartford (1), Hartford (2), Bridgeport (3), and Hamden (1)—a total of 15. *T. popilliavora* colonies were liberated as follows: Ridgefield (2), Bridgeport (3), Hamden (1), New Haven (2),

Stamford (2), New Canaan (1), Danbury (1), East Port Chester (1), Greenwich (1), East Hartford (2), New London (1), Putnam (1)—a total of 18.

Recoveries for *Centeter cinerea*, *T. vernalis* and *T. popilliavora* were attempted during the year. Beetles parasitized by *Centeter cinerea* were caught in traps June 25 and July 5, but none were taken later in the summer. Evidently this parasite is repeating its history of a few years ago when it was released in Bridgeport, was reported the following year, but failed to survive longer.

Tiphia vernalis was recovered at all the 1936 points of liberation, which include three in Bridgeport and one in New Haven. Localities where the species was liberated in 1937 yielded no recoveries. During the summer of 1938 a grub digging was made at the East Eaton Street point of colonization in Bridgeport. Here it was found that about one-third of the grubs were parasitized by Tiphia, a favorable sign. The reason for failure to collect *T. vernalis* at the sites of 1937 liberations is obscure, but efforts along this line will be repeated in 1939.

Recoveries of *Tiphia popilliavora* were also attempted and the species collected at one locality in Branford and five localities in Bridgeport. Presumably the same species was also observed in East Hartford. These are all survivals from 1937 liberations and indicate that the species has become established in Connecticut.

TESTS OF APPLE SPRAYS

M. P. Zappe and E. M. Stoddard

Tests of various sprays for the control of apple insects and diseases have been carried on for several years in the Experiment Station orchard at Mount Carmel. This is a coöperative project between the departments of Botany and Entomology. The orchard used consists mainly of McIntosh, Fall Pippin, Wealthy, Gravenstein, Northern Spy, King, Sutton and Baldwin varieties.

These tests, carried on over a period of years, have demonstrated that a regular spray schedule using arsenate of lead, lime, and fish oil is very practical for varieties not particularly subject to apple scab. Curculios have been one of the major insect problems in this orchard as well as in other Connecticut orchards. The above mentioned spray has been found to be very efficient in reducing curculio injury. Furthermore, the absence of sulfur in the mixture has allowed natural enemies of red mites and aphids to increase so that it has been unnecessary to apply any special sprays for their control. Scab and sooty blotch have been controlled satisfactorily on the varieties used in the experiments, excepting McIntosh and Fall Pippin.

In 1938, in addition to the lead arsenate-lime-fish oil spray, three plots of McIntosh trees were sprayed with copper compounds with the hope that these might prove of value as fungicides in the control of apple scab and might obviate the use of sulfur with the consequent injury to the enemies of red mites.

Several years ago Bordeaux sprays were tried on apples in this orchard but this material always injured the leaves and russetted the fruit. It was feared that the new copper sprays might also injure foliage and fruit although they had been used safely for the control of diseases on truck crops. The data proved these fears to be well founded, as serious russetting of the fruit resulted. About 133 trees were used in the tests in 1938. The Baldwin, Spy, Sutton, King and Greening varieties were sprayed with the following mixture only, except on July 13 when fish oil was omitted:

Lead arsenate	3 lbs.
Lime	10 "
Fish oil	1 qt.
Water	100 gals.

Each McIntosh and Fall Pippin plot was sprayed with one only of the following mixtures throughout the season, except that part of Plot B was sprayed with the lead arsenate-lime-fish oil mixture after the calyx and that all plots were sprayed with lead arsenate and lime July 13.

A. Flotation sulfur (dry)	5 lbs.
Lead arsenate	3 "
Water	100 gals.
B. Dry lime-sulfur	6 lbs.
Lead arsenate	3 "
Water	100 gals.
C. PRE-BLOSSOM	
Coposil[1]	3 lbs.
Lime	3 "
Lead arsenate	3 "
Water	100 gals.
POST-BLOSSOM	
Coposil	2 lbs.
Lime	2 "
Lead arsenate	3 "
Water	100 gals.
D. Copper phosphate	4 lbs.
Lime	8 "
Bentonite	4 "
Lead arsenate	3 "
Water	100 gals.
E. Copper oxychloride	2 lbs.
Lead arsenate	3 "
Water	100 gals.

Spraying operations started with the prepink spray on April 25, at which time all McIntosh and Fall Pippin plots were treated with copper and sulfur sprays. Pink spray was applied on April 29 on all plots. This was the first spray on the lead arsenate-lime-fish oil plot. The calyx spray was applied on May 10 on all plots. First and second cover sprays were applied according to schedule on all plots on May 19 and June 2,

[1]Copper aluminum silicate.

respectively. On July 13 the last spray of the season, consisting of lead arsenate and lime, was applied. Fish oil was omitted from the mixture because it might cause the lead arsenate to adhere to the fruit and arsenical residues to be too high at harvest time. This mixture was applied to all plots regardless of any previous spray applications.

Results

All fruit was scored for insect and fungous injuries at harvest time. All injuries, however slight, were recorded and the following tables represent percentages of good fruit and of fruit injured by insects and fungi. Some of the McIntosh had been harvested before the hurricane of September 21. All fruit left on the trees on that date was badly injured by the storm and this made scoring a little more difficult.

Table 11. McIntosh Sulfur and Copper Plots

	Dry Lime-sulfur	Dry Lime-sulfur Lead Lime-fish oil	Flotation sulfur	Copper phosphate	Coposil	Unsprayed
Good	70.4	66.38	74.02	12.12	9.71	4.24
Curculio	7.33	3.25	9.95	18.18	35.18	34.92
Codling moth	.04	0	.1	1.	.14	.61
Other chewing insects	3.05	6.9	5.7	1.	1.56	7.62
Scab	20.62	30.28	12.07	27.27	29.15	86.19
Russett				75.7	53.4	

All plots represented in the above table were sprayed six times beginning with the prepink spray. The flotation sulfur plot had the least amount of scab, as was also true in 1936. Apple scab was more abundant than usual on all sprayed plots. This probably was due to the unusual weather conditions which characterized the season, causing a delayed primary infection and subsequent continuous spread due to much rain. Copper sprays were not so good as sulfur for control of scab and had the added disadvantage of russetting the fruit, injuring the foliage and apparently cutting down the killing power of the lead arsenate. This russetting did not injure the apples particularly but spoiled their appearance to such an extent that they would not bring as high prices as the same grade of fruit in the open market. Leaf injury was not especially serious except where copper oxychloride was used. No fruit was obtained from this plot, so the value of the material could not be determined.

Curculio injury was also most abundant on the copper plots and least on the plot which was sprayed with lime sulfur and lead arsenate, up to and including the calyx, and later with lead arsenate, lime and fish oil, as was expected.

TABLE 12. FALL PIPPIN COPPER PLOTS

	Coposil	Copper phosphate	Copper oxychloride	Unsprayed
Good	66.21	28.65	15.87	0
Curculio	7.8	43.84	10.49	22.27
Codling moth	.04	0	.05	0
Other chewing insects	6.93	10.62	3.45	5.14
Scab	21.72	23.86	25.58	96.2
Russett	.18	5.36	60.65	

The copper sprays seemed to do a little less damage to Fall Pippin foliage and fruit than to McIntosh. Russetting of fruit was not very serious except on the plot sprayed with copper oxychloride. Insect injury was high on all plots and the percentage of fruit showing scab was much too high. Coposil was the best of the three copper sprays, producing the highest percentage of perfect fruit and the least amount of scab and insect injured fruit. Russetting on this plot was not serious.

TABLE 13. LEAD-LIME-FISH OIL PLOTS

	King	Northern Spy	Sutton	Unsprayed Sutton	Baldwin	Unsprayed Baldwin	Greening	Unsprayed Greening
Good	96.23	92.76	92.1	13.48	88.78	7.03	59.36	9.01
Curculio	1.34	1.25	5.37	52.34	9.44	44.35	1.3	29.19
Codling moth	0	0	0	.52	.03	.93	0	.21
Other chewing insects	1.02	.38	.99	6.34	.68	9.22	1.68	22.53
Scab	1.4	5.64	1.61	10.17	1.11	17.58	3.62	14.38
Sooty blotch				42.79		59.	3.42	74.25
Aphis							31.5	15.02

The lead arsenate, lime and fish oil spray again produced a high percentage of perfect fruit, over 90 percent for three of the five varieties. One of the remaining varieties (Baldwin) had nearly 90 percent perfect fruit. Greenings bore a very small crop of fruit this year, averaging less than a bushel per tree. About 60 percent of the fruit was perfect, curculios and other chewing insects being very well controlled. The most serious insect injury was due to an infestation of rosy aphids. The greater infestation of rosy aphids on the sprayed plot, as compared to the check, cannot be explained satisfactorily, but the small crop renders the data somewhat questionable.

FIELD EXPERIMENTS IN CONTROL OF THE APPLE MAGGOT, 1938

PHILIP GARMAN

EFFORTS were made this year to control the apple maggot by means of 0.5 percent rotenone clay-filled dusts applied during July and early August. Two orchards were used, that of Mr. Burton at Mount Carmel and Mr. Shepard in Westwoods, about one mile distant. All records were taken from Gravensteins.

At the Burton orchard, the portion containing Gravensteins was divided into six plots, four of which were sprayed June 22 with 10 pounds lime, 3 pounds lead arsenate, and 1 quart fish oil in 100 gallons. Following this treatment, three of the plots were dusted four times with 0.5 percent rotenone dust, and three were dusted twice with the same mixture. All drops and picked fruit were carefully sampled and cut open. Results of this work, presented in Tables 15 and 16, show that 30 to 40 percent of the total fruit was infested in spite of treatment, and the picked fruit cut open averaged between 10 and 20 percent infested. Apparently the dusts killed some of the flies, but many were seen on the trees during the wettest period in July. Also, the dusts were removed too rapidly by heavy rainfall during July to be completely effective.

At the Shepard orchard, two dusts were compared, one the usual rotenone clay-filled dust, the other a special dust containing some sulfur. Samples were taken from the count trees and the total fruits were counted, applying the percentage to the total from each lot. As will be seen from Table 14, little or no difference was apparent in the two plots. Few flies were seen in the trees during the season. In these tests not only the trees where counts were made were dusted but also trees immediately surrounding for an area of about one acre. The Gravenstein trees have been heavily infested each year for the past several years. As in the case of the Burton orchard, it appears that more than one-third of the total crop was infested, although in this case the picked fruit did not show up quite so favorably as in the Burton experiment.

In general, the conclusions to be drawn are that rotenone dust, while successful in our 1937 tests, failed to equal that performance in 1938 partly because of the heavy July rainfall. It was evident this year that high temperatures and humidities destroyed the rotenone rapidly, and flies were able to lay large numbers of eggs despite the 10-day interval of application which theoretically should be ample considering the material and the nature of the insect.

TABLE 14. APPLE MAGGOT CONTROL, SHEPARD ORCHARD, 1938
GRAVENSTEIN

Tree and Treatment		Total fruits from tree	Number cut open	Estimated percentage of total infested
0.5% rotenone dusts	(B2)	5,730	429	37.1
	(C2)	5,569	452	40.0
July 5, 16, 25, Aug. 6[1]	(C3)	4,987	520	31.6
		16,286	1,401	36.4
0.5% rotenone dusts with sulfur	(C6)	6,315	479	45.2
and spreader	(C7)	6,672	594	37.0
July 5, 16, 25, Aug. 6[1]	(B7)	4,663	537	32.2
		17,650	1,610	38.1

[1]Both plots sprayed June 15 with 10 pounds lime, 3 pounds lead arsenate, 1 quart fish oil in 100 gallons.

TABLE 15. COMPARISON OF PICKED FRUIT FROM BURTON ORCHARD COLLECTED AUGUST 17, 1938
GRAVENSTEIN

		Percent infested
Dusted 4 times, sprayed 6/22		13.9
		11.6
		17.3
	Average	14.2
Dusted twice, sprayed 6/22		17.3
		16.6
		9.6
	Average	14.4
Dusted 4 times, not sprayed 6/22		20.2
Dusted twice, not sprayed 6/22		23.1

TABLE 16. COMPARISON OF DROPPED FRUIT FROM BURTON ORCHARD, 1938
GRAVENSTEIN

		Percent infested
Dusted 4 times, sprayed 6/22		41.9
		34.7
		39.2
	Average	38.6
Dusted twice, sprayed 6/22		43.3
		46.7
	Average	45.0
Dusted 4 times, not sprayed		34.5
Dusted twice, not sprayed		58.6

CONTINUED EXPERIMENTS WITH STICKERS

PHILIP GARMAN AND C. E. SHEPARD

WORK with sticker tests was continued in 1938, though it was possible to make only one series of applications in the field. Laboratory tests were conducted with glass plates and a number of different materials in addition to those used in the field. Although carried on with considerable care by Mr. Sprague, the results are so confusing that no attempt will be made to give the data in detail. These tests were made for the purpose of determining, if possible, the most suitable stickers for lime-lead arsenate combinations. Several soaps were tried, including potash fish oil soap, ammonium oleate, and triethanolamine oleate, none of which showed any improvement over the controls in these tests.

In the field, Baldwin trees were sprayed with 10 pounds lime, 3 pounds arsenate of lead, and the following stickers per 100 gallons: (1) 1 quart light pressed menhaden fish oil, (2) 2 quarts 30 percent fish oil soap, (3) 1 quart triethanolamine oleate soap. Of the three stickers, only fish oil retained the spray on the foliage in quantities appreciably greater than the check. Results of the field tests are given in Table 17.

TABLE 17. STICKER TESTS, FIELD EXPERIMENT, 1938
BALDWINS

Material		Immediately after spray[1]	Sample Aug. 10 Amount and % remaining		Sept. 6 Amount and % remaining	
Spreadol		1,570	295		137	
		1,095	338			
	Average	1,332	316	24.4	137	10.2
Fish oil		1,398	702		304	
		1,520	702			
	Average	1,459	702	47.4	304	20.1
Triethanolamine oleate		1,245	427		181	
		1,305	427			
	Average	1,275	427	32.7	181	14.1
Lime-lead arsenate only		1,065	263		142	
		1,005	263			
	Average	1,035	263	25.4	142	13.6

Material	Loss after first period %	Loss after second period %
Fish oil	52.6	79.9
Triethanolamine oleate soap	67.3	85.9
Spreadol (Potash fish oil soap)	75.6	89.8
No sticker	74.6	86.4

[1]Micromilligrams As_2O_3 per 100 discs 1 sq. cm. each, sprayed July 26.

Although not included in this series, one of the "dynamite" sprays developed in the northwest Pacific Coast region was compared with lime-lead arsenate-fish oil. Considerably greater amounts of spray deposit could be seen on the foliage throughout the season in the "dynamite" plots, and the fruit was in much better condition as regards insect control than with the straight lime-lead arsenate-sticker sprays. In these tests, trees receiving two sprays (pink, calyx applications) of lime-lead arsenate-fish oil and two cover sprays of 6 pounds lead arsenate per 100 gallons plus the dynamite mixture showed 87 to 91 percent clean fruit even though the last spray applied was on June 13. However, analysis of the fruit after nearly 29 inches of rainfall showed some of the apples to be above tolerance for lead and slightly above for arsenic. Following are the insect control results with dynamite and fish oil stickers.

TABLE 18

Treatment	Total fruits examined	Percent free of insects and disease	Percent curculio
Lime-lead arsenate-fish oil (4 sprays)	2,801	77.4	4.6
Lime-lead arsenate-fish oil (2 sprays) Lead arsenate, 3 lbs. to 100 gals. plus dynamite sticker (2 sprays)	2,041	91.1	2.8
Lime-lead arsenate-fish oil (2 sprays) Lead arsenate, 6 lbs. to 100 gals. plus dynamite sticker (2 sprays)	3,428	87.3	1.7

Examination of the fruit was also made for apple maggots and indicated very good results. The apples were less than 5 percent infested even though no July sprays were made. These results are merely an indication of what may be done with such mixtures.

As regards disease control, a single McIntosh in the dynamite-treated plots was too heavily infected with scab for the treatment to be called satisfactory. A fungicide stronger than lead arsenate is evidently needed for the variety mentioned.

USE OF KARAYA GUM AS AN ACTIVATOR FOR NICOTINE SULFATE AGAINST *APHIS RUMICIS*

Philip Garman

Karaya gum has been advocated as an activator to increase the effectiveness of nicotine sulfate. In order to determine how much increase in kill may be expected from its use, a series of experiments was conducted with *Aphis rumicis* as the test insect. These tests were conducted under as uniform conditions as possible, using equal spray pressure and keeping the aphids in a constant temperature room after treatment (76° F., 60-65 percent relative humidity).

Our results indicate that there was little or no incre se in toxicity to *Aphis rumicis* wherever nicotine and karaya gum were used without a wetting agent such as sodium oleate. When combined with nicotine sulfate plus a wetting agent, there was an increase of 8 to 27 percent, as indicated in Tables 19 and 20.

Table 19. Effect of Adding Karaya Gum to Nicotine Sulfate Without a Wetting Agent for Killing *Aphis rumicis*

Treatment		Young aphids		Mature aphids	
		Total	Percent dead or moribund	Total	Percent dead or moribund
Nicotine sulfate	0.2 grams	430	42.7	116	6.0
Water	1,000 cc	290	65.1	143	24.4
		93	69.8	32	40.6
Nicotine sulfate	0.2 grams	545	63.9	78	1.0
Karaya gum	1.0 grams	269	61.7	126	19.0
Water	1,000 cc	110	70.9	51	19.5
Check—no treatment		335	3.5	48	0.0
		132	2.2	62	0.0
		123	4.0	45	0.0

Table 20. Effect of Adding Karaya Gum to Nicotine Sulfate and Wetting Agent for Killing *Aphis rumicis*

Treatment		Young aphids		Mature aphids	
		Total	Percent dead or moribund	Total	Percent dead
Sodium oleate	1.0 grams				
Nicotine sulfate	0.1 grams	712	85.5	110	50.0
Water	833 cc				
Sodium oleate	1.0 grams				
Nicotine sulfate	0.1 grams	619	96.7	81	58.0
Karaya gum	1.0 grams				
Water	833 cc				
Sodium oleate	1.0 grams				
Nicotine sulfate	0.1 grams	402	95.2	57	77.1
Karaya gum	1.0 grams				
Water	833 cc				
Check—no treatment		361	5.5	45	8.8

CONTROL OF THE ORIENTAL FRUIT MOTH IN PEACHES AND QUINCES

PHILIP GARMAN

PEACHES: During 1938 our experimental peach orchard was used to test talc-sulfur-lime dusts, nicotine-bentonite spray, and a special spray supplied by a large insecticide company. Owing to the fact that the last material is not on the market nor is its composition known to us, it will not be discussed in detail.

In these experiments, all drop fruits were cut open, as well as one-third to one-fifth of all picked fruit. The percentages obtained from the samples were then applied to the total picked fruit, after which the drop count was added and the total percentage calculated. Results are presented in Table 21.

During August when insecticide applications were being made, the weather was quite favorable with quiet periods suitable for dusting and only one heavy rainfall, on August 11.

The oil-talc-sulfur dust treatments consisted of one dust of 30 percent sulfur, 10 percent lead arsenate, 25 percent lime, 30 percent talc and 5 percent oil, the remainder of 60 percent sulfur, 20 percent talc, 15 percent lime and 5 percent oil. There was a reduction in "new" injury of about 20 percent resulting from these treatments, though some of the trees carried a high infestation at harvest. The reduction in total injury was 15 percent. All trees were thoroughly covered with dust and the peaches still carried considerable residue at harvest.

In the case of nicotine-bentonite spray, reduction in injury was slightly less than with the talc-oil-sulfur dust, and in neither case was satisfactory control obtained. See Table 21. The special spray was somewhat more effective than either oil dust or nicotine-bentonite.

Quinces: Attempts to control quince insects have been made for a period of five to six years, and although our planting is not large and the fruit counts are relatively small, the length of time during which the tests have been conducted warrant a report at this time. Nearly all sprays have consisted of lead arsenate with or without lime sulfur, and these were followed in some tests with derris or cubé. The best control of insects amounted to 86 percent clean fruit as determined by cutting open the quinces after picking. In this test a single tree was sprayed three times and then covered with tobacco cotton from about the first of August until harvest. Sprays of lead arsenate and lime sulfur applied once a month keep the fruit reasonably clean until late in August. The 1937 tests where no lime sulfur was employed gave discouraging results. Evidently the combination of lime sulfur and lead arsenate with a sticker is more effective.

Because of the fact that only seven to ten trees are involved in these experiments, checks were considered to be of little value, especially since it appears difficult to raise sound quinces without sprays in this vicinity. The counts for 1932 and 1934 give an indication of what normally occurs,

and the infestation recorded for 1937 also gives a measure of what may be expected. See Table 22.

Of the years covered by the table, 1937 and 1938 were probably the worst for Oriental fruit moth trouble, and 1934, 1935 and 1936 were years of moderate infestations. Little difference has been noticeable in quince curculio abundance from year to year except a decline after the first two or three years of spray treatments.

Inspection of the quinces on the trees during the summer frequently indicated good control of quince insects until the last of August or first of September. It would appear advisable, therefore, to continue treat-

TABLE 21. ORIENTAL FRUIT MOTH CONTROL, MOUNT CARMEL, 1938
VARIETY, ELBERTA

Tree	Total fruit	% recent injury	Av. %'s	Treatment
C1	801	27.3		
C2	450	25.5		
B3	767	17.4		Oil-sulfur dust
A23	948	15.1	16.2	Aug. 3 Lead arsenate, lime, talc, sulfur, oil
A24	642	12.3		
B23	704	9.7		Aug. 10 Lime, talc, sulfur, oil
B22	415	8.6		Aug. 18-19 " " " "
				Aug. 25-26 " " " "
I18	94	53.1	50.3	
H17	267	47.5		
A18	518	17.3		
B18	632	16.4	16.6	General Chemical Co. spray, 1.5 to 2 lbs. to 100 gals.
C18	610	13.6		
C17	362	19.3		
H2	269	29.7		Aug. 3
I22	427	18.7		Aug. 10
H22	610	22.7	26.8	Aug. 18-19
L24	121	36.3		Aug. 26
I24	425	26.8		
A11	631	20.1		
B11	755	24.1	28.6	Nicotine-bentonite spray, 4 lbs. to 100 gals.
A12	247	39.6		
B12	220	30.9		Aug. 3
				Aug. 10
I9	665	26.0		Aug. 18-19
H8	428	46.4	36.4	Aug. 25
I7	458	36.9		
A8	923	38.8		
A9	682	42.6	40.8	
D7	959	36.4		
C8	540	45.7		
F4	878	43.5		Checks
F8	778	35.6	39.7	
F16	513	46.7		
F22	1166	32.3		
L12	254	62.2	60.0	
K12	121	57.8		

TABLE 22. CONTROL OF QUINCE INSECTS, MOUNT CARMEL, 1934 to 1938

Year	Treatments	Dates of sprays	Percentage free of insect damage
(1) 1934	3 sprays—lead arsenate, dry lime sulfur followed by 6 sprays—derris, skim milk powder	May 29 Aug. 20 June 28 Aug. 29 July 31 Sept. 5 Aug. 9 Sept. 11 Aug. 14	80.0
	3 sprays—lead arsenate, dry lime sulfur Covered with tobacco cotton August 1	May 29 June 28 July 31	86.8
(2) 1935	Lead arsenate, dry lime sulfur, glue	June 30 July 10 Aug. 6	83.9
(3) 1936	Lead arsenate, dry lime sulfur, glue	May 28 July 6 Aug. 8	32.6
(4) 1937	Lead arsenate, lime, fish oil	June 2 June 16 July 14 Aug. 5	11.4
(5) 1938	Lead arsenate, liquid lime sulfur, manganese sulfate, soybean flour	May 25 July 7 July 30 Aug. 18	69.2
(6) 1934	Checks—no treatment		6.4
1932			10.3

ments much closer to harvest time unless the insecticide can be held over in an active state longer than has been the case in these experiments. Whether it would be practical to apply six sprays of derris or cubé is doubtful, but our results show an increased percentage of clean fruit from their use.

Dilution of the various materials in 100 gallons is as follows: Lead arsenate, 3 pounds; liquid lime sultur, 1 gallon; dry lime sulfur, 4 to 6 pounds; casein glue, 0.5 pound; soybean flour, 1 pound; skim milk, 1 pound; fish oil, 1 quart; and lime, 10 pounds.

REPORT OF A SURVEY OF ELM BARK BEETLE POPULATION IN WESTERN CONNECTICUT IN 1938

B. J. Kaston and D. S. Riggs

During the summer of 1938 (June 16–September 16) a survey of the elm bark beetle population in the western part of Connecticut was undertaken with the following objectives in mind: First, to determine the relative proportions of Scolytus and Hylurgopinus in the area covered; second, to attempt an evaluation of the conditions which render a tree attractive to beetles and suitable for breeding, and third, to compare the two species with regard to type of breeding material selected. It was felt that such a survey might be of value in planning a program aimed at control of the Dutch elm disease. The findings presented here are not to be regarded as more than a preliminary guide to the status of elm scolytids in the State.

Method

At first an attempt was made to locate dead or dying trees by searching swamp areas where there were known to be large numbers of elms; but it was soon realized that more could be found by driving slowly along roads looking for trees in the surrounding countryside. For each tree sampled notes were taken on the terrain, the condition of the tree, the cause of death when known, and the trunk diameter breast high. Samples of bark were then removed at various places and the entrances or egg galleries counted. In bark long dead, where the galleries were hard to distinguish, a satisfactory count on the wood surface was made by brushing it clean and marking each gallery with a colored pencil. The area of each sample was measured and the condition of the beetle population noted. Studies were not confined to trees containing live beetles or their young; old galleries as well were counted whenever they were discernible. Few of the galleries were more than two or three years old, as the markings are usually soon obliterated by decay.

Sources of Error

The best method of sampling is obviously the one which will approximate most closely a true cross-section of the entire population. Hence it would be desirable: (1) To sample as large a number of trees as possible, (2) to space the sampled trees so that they would be proportionately representative of the breeding places available throughout the area studied, (3) to take several samples from each tree so as to include limbs of different diameters and different degrees of exposure and dryness, (4) to have the areas of the samples as large as possible and proportional to the total area of the part of the tree they represent.

In the present survey time did not permit the above procedure to be followed except in a very general way: 1.. The number of trees sampled was by no means large enough to permit a town-by-town analysis, since the average number of trees per town was only 2.1 and the distribution among towns was uneven. An attempt was made to find trees in each town in Fairfield, Litchfield and New Haven counties (with the exception

of the town of Meriden) but in several towns we were unable to locate any dead or dying elms. In the southern portion of Fairfield County, in particular, it was very difficult to find suitable material, due in part to the intensive pruning and removal program which has been in progress there. 2. It is by no means certain that the trees sampled fairly represent the distribution of breeding material. As a rule no more than two or three trees were sampled in a small area (even when more were available) in order not to give the region undue weight, but in general whatever material could be found was taken. It is probable that there are large inaccessible areas, where breeding places are abundant, that are not represented at all in this survey. 3. Unfortunately, at the outset the importance of sampling small branches for Scolytus was not realized; later, whenever possible, samples were taken from various diameters down to two or three

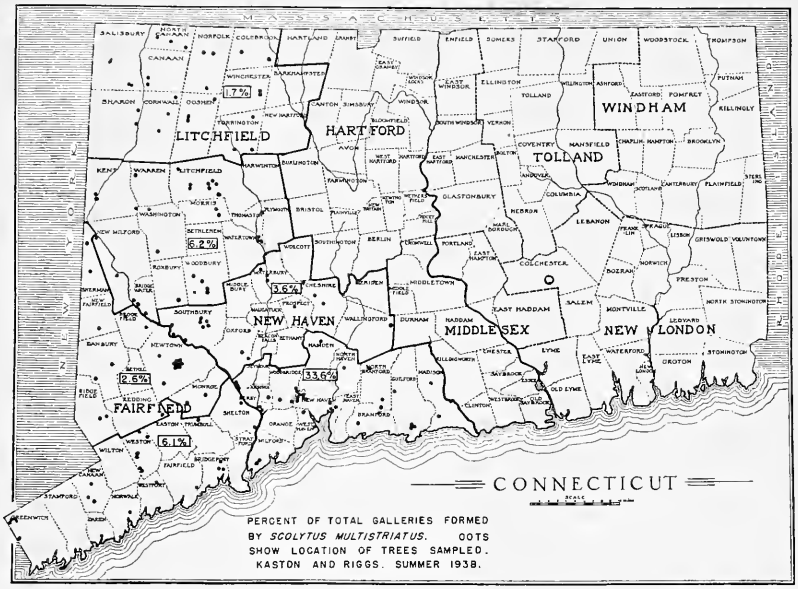

FIGURE 6.

inches. 4. No attempt was made to take samples of uniform size. Since the principal object was to determine the distribution and density of Scolytus in the area covered, there was a tendency to count more galleries in trees where that species was present. Hence it is probable that the percentages of Scolytus given below are somewhat too high.

It is apparent that the figures are to be taken only as a rough estimate of the relative proportions of Scolytus and Hylurgopinus. The analysis of trees in which both species were present is probably less subject to error than the distribution percentages, since its accuracy is not influenced by the locations of the trees.

Analysis of Trees

Location: The locations of the 160 trees sampled are indicated on the map. Their distribution was fairly even in the three counties covered:

TABLE 23. DISTRIBUTION OF TREES SAMPLED

Fairfield County	Av. of one tree for every 14.0 sq. mi.
New Haven County	" " " " " " 11.0 " "
Litchfield County	" " " " " " 15.4 " "
Whole area	" " " " " " 13.5 " "

Terrain: Only a rough classification by terrain was attempted. There was no apparent relationship between the beetle population and the immediate environment of the trees but it is possible that a more careful and extensive study would reveal significant differences.

TABLE 24. LOCATION OF TREES SAMPLED

Location	No. of trees	% of total
Street or roadside	58	36.2
Lawn, meadow, or field	46	28.8
River or stream bank	40	25.0
Swamp	16	10.0

Condition: The conditions of the trees were estimated as follows:

TABLE 25. CONDITIONS OF TREES SAMPLED

	No. of trees	% of total
Less than 25% dead	22	13.7
25-49% dead	19	11.9
50-74% dead	11	6.9
75-99% dead	27	16.9
Wholly dead	78	48.7
Condition unknown (logs on ground)	3	1.9

Cause of Death: The cause of injury or death could be ascertained for only 35 trees, or 21.9 percent of the total. The known causes are listed in Table 26.

Probably many more trees were killed or injured by flooding or defoliation than is indicated here, but there was only circumstantial evidence of this in most cases. For a majority of the trees a specific injurious agent could not be determined. Poor nutrition, winter injury, fungous diseases other than Graphium, and other factors difficult to evaluate undoubtedly play an important role in preparing elms for attack by Scolytids.

It would be of interest to correlate the cause of death with the attractiveness to beetles as measured by the density of population. Unfortunately the groups listed below are too small to allow such an analysis

Table 26. Cause of Death of Trees Sampled

Cause of death	No. of trees	% of this group
Cut down and left unbarked	10	28.6
Girdled and left standing	2	5.7
Fire	2	5.7
Gas leakage around roots	2	5.7
Flooding	5	14.3
Silvicided (treatment with copper sulfate)	3	8.6
Lightning	2	5.7
Wind thrown	4	11.4
Graphium infection	4	11.4
Successive defoliation by insects	1	2.9

except, perhaps, in the case of the trees cut down and left unbarked. Here the average density of Hylurgopinus (3.19 entrances per square decimeter) was somewhat higher than the average density for all trees (2.46 entrances per square decimeter) though the density of Scolytus (too small in number to be significant) was practically the same. This would seem to indicate that live trees cut down and left with the bark intact are particularly attractive to beetles, perhaps because near the ground, particularly if shaded, they dry out more slowly than they would otherwise and are receptive to beetles for a longer period of time.

Size in Relation to Entrance: The trunk diameters breast high ranged from 5 inches to 60 inches with an average of 22.7 inches. This wide range enabled us to compare the densities of the beetle population in material of different diameters. The density of Scolytus was slightly higher in small limbs than in large ones. In the case of Hylurgopinus, however, the density was least in branches three inches or less in diameter and rose to a maximum in the larger limbs and trunks. The figures are given below:

Table 27. Size in Relation to Entrance

Diameter	Av. density[1] in entrances per sq. decimeter Scolytus	Hylurgopinus
Under 4 inches	.69	1.57
4— 6 "	.67	2.15
7—12 "	.60	2.68
13 inches or above	.53	2.76
All sizes	.63	2.46

[1]In these figures densities of less than .1 entrance per square decimeter have been omitted from the averages since with very light populations it is impossible to calculate densities accurately.

More important than the lower density in small limbs is the fact that in many trees Hylurgopinus did not breed at all in branches of four inches or less in diameter even when the population was dense in other

parts of the same tree. In all probability the bark of small limbs dries out too quickly to be suitable for this species. Dried larvae have often been found in small limbs, while exit holes are uncommon—evidence that even when such limbs are attacked the mortality is high. It is apparent, therefore, that a sickly tree with many small dead branches is less apt to harbor breeding Hylurgopinus than a tree in good condition but with one or two large dead limbs. These observations, however, do not apply to Scolytus as will be seen from data presented subsequently.

Beetle Population: As already stated, this survey included both "old" galleries, made in previous years, and "new" galleries, made by beetles entering during the current season. The following table gives the number of trees with old or new galleries of each species and also indicates the number of trees with no beetles, with Hylurgopinus or Scolytus only, and with a mixed population:

Table 28. Old and New Galleries

		Scolytus multistriatus					
		Both old and new	New only	Old only	None	Hylurg. only	Total
Hylurgopinus rufipes	Both old and new	3	3	7	15	84	28
	New only	3	18	2	17		40
	Old only	0	0	23	52		75
	None	0	3	3	11		17
	Scolytus only	6					
	Total	6	24	35	95		160 / 160

Thirty trees, or 20.6 percent of the total, contained both old and new galleries, indicating that as a tree declines year by year successive portions of it may become attractive to beetles. Thus it is impossible to conclude from a single sample, showing old galleries only, whether or not a tree also harbors a new brood of beetles.

Only 11 trees (6.9 percent of the total) showed no evidence of ever having been attacked by scolytids. Of these, five had only small dead branches which probably dried too rapidly to attract beetles. For the

others no satisfactory explanation can be offered. Occasionally a tree, apparently in excellent condition for entrance, will harbor only a small population or none at all when nearby trees are full of beetles. This serves to emphasize the fact that it is usually impossible to tell from the appearance of a dead limb or tree whether or not it is in suitable condition for entrance.

Distribution of Scolytus

Collins[1] has recently summarized the distribution of *Scolytus multistriatus* in the United States. In Connecticut this species is known to be generally distributed in Litchfield, Fairfield and New Haven counties, and in the southwestern half of Hartford County. It has also been reported from Middletown and Durham in Middlesex County. Only in Glastonbury has it been found east of the Connecticut River. The area covered by this survey includes, therefore, the major portion of the Scolytus-infested region in Connecticut.

Any estimate of Scolytus percentage could hardly be reliable unless based on a total count of at least 2,000 galleries. With the limited data of this survey, therefore, each county was divided roughly into halves, as shown on the accompanying map. The percentages refer to the percent of Scolytus in the total number of galleries counted. By far the largest proportion (33.6 percent) was found in the southern half of New Haven County. Between the other sections the differences are so small as to be of questionable significance. The actual figures are given below:

Table 29. Relative Abundance of Beetles

	Trees			Galleries			
County	No. sampled	No. with Scolytus	% with Scolytus	Hylurgopinus	Scolytus	Total	% with Scolytus
No. Litchfield	28	8	27	3,019	52	3,071	1.7
So. "	32	12	38	4,680	308	4,988	6.2
No. Fairfield	21	8	38	2,123	56	2,179	2.6
So. "	24	10	42	2,539	164	2,703	6.1
No. New Haven	18	5	28	2,733	101	2,834	3.6
So. " "	37	22	60	2,261	1,145	3,406	33.6
Whole area	160	65	41	17,355	1,826	19,181	9.5

Since Scolytus presumably spread to Connecticut from New York it is difficult to account for the high percentage of this species in and around New Haven. Whatever the explanation, it seems reasonable to expect in

[1]Jour. Econ. Ent. 31: 192-195. April, 1938.

the near future a spread from the heavily infested New Haven area to the adjacent portion of Middlesex County from which it has not yet been reported. Indeed a careful search of that region at the present time might demonstrate that Scolytus is already established there.

It will also be seen from the above table that although the percentage of Scolytus galleries in the area was small, the percentage of trees infested by this species was relatively large. Thus in northern Litchfield County, Scolytus galleries formed but 1.7 percent of the total, but these were distributed in more than a quarter of the trees. For the area as a whole, Scolytus represented less than 10 percent of the total population, yet 41 percent of all trees had been attacked by this species. This wide distribution despite relatively small numbers is consistent with the greater tolerance of Scolytus to unfavorable conditions of water content. This adaptability will be discussed subsequently.

Conditions Favoring Attack by Scolytids

Observations on the condition of the bark in which beetles were breeding justify the categorical statement that neither species ever attempts to breed in healthy elm branches even when adults are numerous and material suitable for entrance scarce. It is true that not infrequently galleries have been found in limbs bearing a considerable amount of healthy foliage, but in such cases they have always been confined to a strip of dead or dying bark leading to a dead branch or surrounding a canker or other injury. In general, only when a limb is obviously dying does it first become attractive to scolytids. Limbs with wilting yellow leaves, or at most a small amount of green suckering growth, will sometimes be entered even when the bark is still quite moist and white. Under such conditions the galleries are often short and flooded with sap and the adults either drowned or forced to abandon the galleries. Rarely, where the bark is thick and the wood surface very moist, the egg galleries are constructed wholly in the bark instead of between bark and wood. Once an egg gallery has been successfully started, the bark above and below it usually becomes brown and dead; thus the interruption of sap flow by the parent gallery provides more suitable material for the development of the young larvae. Scolytus seems to be able to tolerate more moisture than Hylurgopinus.

The most favorable conditions for entrance seem to be provided by limbs which are completely dead but which have died very recently. Here the sap-flow has ceased but the moisture content is still high—a situation ideal for both breeding adults and their progeny. As time goes on the bark becomes drier and less suitable for entrance. The rapidity with which this takes place depends on several factors, notably the size of the limb (and thickness of the bark) and the degree of exposure to sun and wind. Small, unshaded top branches will dry most rapidly and provide the least favorable breeding places, while larger shaded limbs, trunks with thick bark, and logs lying in shady places on moist ground will dry much more slowly and remain for some time in receptive condition.

Quite apart from drying, with the passage of time scolytids must suffer from increasing competition with other bark beetle larvae, especially those of *Saperda tridentata*. Or the bark may be rendered unsuitable by a heavy growth of fungi. These several factors combine to produce a

fairly rapid decline in attractiveness to beetles and survival of their offspring. It is probable that a tree or limb becomes wholly unsuitable for breeding scolytids one year, or at most two years, from the time sap-flow ceased. This conclusion is supported by the fact that we have never found old and new galleries intermingled in the same piece of bark.

It follows, therefore, that in any sanitation program aimed primarily at the reduction of elm scolytid breeding places, an attempt must be made to remove dead trees or limbs soon after they have died and this must be continued year after year. Specifically, limbs or trees killed from about the first of October to about the middle of July may be attacked in the early summer and should be removed before the callows emerge between mid-July and October. Those killed from July 15 to about the last of September may be subject to late summer attack and should be removed before the overwintering larvae emerge, beginning early the following June.

Analysis of Trees in Which Both Scolytus and Hylurgopinus Were Present

Of the 160 trees sampled, 61 or 38.1 percent had been attacked by both Scolytus and Hylurgopinus. This group afforded an opportunity to compare the two species in regard to type of breeding material preferred. Early in the survey we were impressed by the greater proportion of Scolytus in the smaller limbs and branches. Of all the galleries of this species seen, 65.5 percent were found in limbs of six inches diameter or less, while the corresponding figure for Hylurgopinus was only 25.6 percent. The following table shows the percentages in material of various diameters:

Table 30. Relation Between Diameter and Infestation

Diameter	% of total Scolytus	% of total Hylurgopinus	% Scolytus of all galleries
Less than 4″	29.8	9.8	34.0
4″— 6″	35.7	15.8	27.6
7″—12″	18.7	38.2	8.3
13″ or above	15.8	36.2	7.3
All sizes	100.0	100.0	14.4

Exit holes of Scolytus have been found in branches with a diameter of one and one-half inches, whereas Hylurgopinus rarely attempts to breed in such small material. That this difference is due to a greater tolerance for dryness on the part of Scolytus is further evidenced by the distribution of the two species in horizontal limbs or logs lying on the ground. In such material it is usual to find Hylurgopinus breeding in the shaded underside of the limb, while Scolytus will usually attack the drier portions on the sides and top. In regions where Scolytus is abundant, therefore, it would seem important in pruning to remove even the smaller branches.

SUMMARY

A study of 19,181 scolytid galleries from 160 elms in Fairfield, Litchfield and New Haven counties in western Connecticut has indicated that while *Scolytus multistriatus* is widely distributed it represents only about 9.5 percent of the total elm bark beetle population throughout most of the area. In the southern part of New Haven County, however, Scolytus makes up 33.6 percent of the total.

Neither Scolytus nor Hylurgopinus will breed in healthy parts of the tree. The most favorable conditions are provided by limbs which have died very recently. Any elm wood dead for more than one, or at most two, years is wholly unsuitable for breeding bark beetles, due chiefly to drying of the bark. Large shaded limbs remain attractive longer than small exposed branches.

Scolytus exhibits a greater adaptability to varied conditions of moisture than Hylurgopinus. It is found breeding in small branches much more commonly than the latter species. While the density of Hylurgopinus is lowest in limbs of small diameter, the density of Scolytus is at least as great in small limbs as in large.

On the basis of these findings, it is suggested that in sanitation work an attempt should be made to remove dead elm wood soon after it has died. In regions where Scolytus is abundant the smaller branches are of significant importance as breeding places.

NOTES ON THE OCCURRENCE AND LIFE HISTORY OF *OCHROSIDIA BOREALIS* ARROW, IN CONNECTICUT

J. P. Johnson

Distribution

The attention of the Entomology Department was first called to *Ochrosidia borealis* Arrow when grubs of this species were received from Lawrence, Long Island, together with a request for identification and control recommendations. The grubs were sent in November, 1935. They had been injuring a lawn. During October, 1936, two lots were received for identification from Greenwich, where severe lawn damage had occurred. The following fall, specimens arrived from East Norwalk, Fairfield and Greenwich.

Visits were made to the infestations, and it was found that upwards of 15 acres of lawn area were severely injured or destroyed by the grubs. Additional requests for information and field observations, during 1938, indicate that the town of Greenwich, especially along the shore, is generally infested, as records of the occurrence of the insect are available for Greenwich proper, Cos Cob, and Old Greenwich. This insect also occurs in Greens Farms and one grub has been found in East Hartford.

Ochrosidia borealis Arrow occurs as far south as Alabama, and westward into Kansas and Nebraska. In Kansas and Nebraska, the grubs have been found infesting corn, wheat, and oat fields, as well as turf.

Life History

This insect is a Scarabaeid and was originally described by Burmeister, under the sub-family Dynastinae, tribe Cyclocephalini, as *Cyclocephala villosa*. Two species received the name of *Cyclocephala villosa*, and since the first, a Bolivian species of Blanchard's, had priority, Arrow substituted *borealis* for *villosa*. Casey, in his review of the sub-family Dynastinae, placed it under the new genus, *Ochrosidia*. Neiswander refers to *Ochrosidia borealis* as the Annual White Grub. It is believed that this common name is confusing because many species of grubs annually infest lawns and turf. Perhaps the name Western Annual White Grub might be appropriate for this insect.

In view of the injury to turf during 1936 and 1937 in Connecticut, and the fact that this insect was a new pest, it was considered advisable to determine its life history in the State.

When laid, the eggs are pearly white, ovoid and delicately reticulate. They are generally larger than those of the Japanese beetle or the Asiatic beetle. At first they measure from 1.56 to 1.76 mm. in length and 1.19 to 1.35 mm. in width. In some the sides are nearly parallel and the ends rounded.

The maximum number of eggs laid by a single female beetle under insectary conditions was 29 and the minimum 3, while the average was between 11 and 12. Females collected in the field from pupal skins on

July 6 and placed with males on July 7, laid eggs on July 8. The majority of eggs hatched in approximately 20 to 22 days. A field observation revealed that most of them were laid at a depth of between 4.5 and 6 inches below the surface of the soil. Some were laid 1.5 inches below the surface, and none was found below 6 inches.

During embryonic development the eggs become more rounded and larger, as do those of other Scarabaeidae. Just before hatching takes place, the mandibles and portions of the head capsule which have become darkened in color are visible through the shell.

The grubs pass through three instars, as observed in the summer of 1938. Third instar grubs were found in the field on September 7. The fully grown larva is approximately 23 mm., or seven-eighths of an inch, in length. The head is yellowish brown in color and the body is white, often appearing to be gray when the alimentary tract is filled with food. The anal slit is transverse and arcuate, while the raster has a sparse group of coarse, long, hooked brown spines, becoming larger toward the anal slit.

Field diggings made in East Norwalk revealed a population of 64 third-instar grubs to one square foot, and two diggings in Greenwich yielded 33 and 48 grubs to one square foot, respectively.

The grubs react to changes in soil temperature in a manner similar to the reactions of the Japanese beetle and Asiatic beetle grubs. Some individuals descend to a depth of 18 inches to hibernate. One digging on April 12, 1938, before the upward movement of the grubs took place, revealed eleven grubs in the upper 3 inches of soil, nineteen grubs 3 to 9 inches below the surface, and one grub 9 to 12 inches down. In diggings made to determine winter killing, 30 of 61 grubs found were dead. In other diggings made elsewhere at a later date, it was noted that many dead grubs occurred.

When newly transformed, the pupa is creamy white and gradually turns to a reddish brown. It is approximately 17 mm., or eleven-sixteenths of an inch, in length and about half as broad. Prepupae and pupae were found in Greenwich on June 14. The length of the prepupal period is approximately one week while the pupal stage lasts about 18 days. Under field conditions the pupae were found mainly at a depth between 3.5 and 5 inches.

The adult is chestnut brown in color, approximately 12.5 mm., or one-half inch, in length, about half as broad, and is entirely covered with fine hairs. The males are distinguished from the females by their larger tarsal claws and longer antennal lamellae.

The first adults were captured around lights, on the night of June 24, in East Norwalk. On the night of June 25, at the same location, 389 adult beetles were captured in two homemade light traps placed on stands, 30 inches above the ground. The traps consisted of pans partially filled with water covered to a depth of one-quarter inch with kerosene. Glass baffle plates 12 inches in height were placed on each pan with an electric light bulb suspended directly above.

It was determined by observation that the beetles are in flight from immediately before dusk to approximately 10:30 P. M. The male beetles

usually fly about one to two feet above the ground in search of the females. Some, however, will fly somewhat higher and dart away in the dark or toward a light. The females in most cases hardly have an opportunity to fly before they are captured by the males. They are usually found on the tips of the grass blades or on the ground. The Ochrosidia wing vibration produces a unique sound when the adult beetle begins flight.

After observing the habits of the beetles while in flight, four traps were set on the ground. On the night of July 5, a total of 3,924 beetles was captured. The number captured in the traps decreased each succeeding day until July 25, when the last single specimen was taken. Altogether 18,967 beetles were captured from an area approximately three acres in extent. None was taken when rain was falling or on cool nights. A record of the sex of beetles taken in two traps showed that 8,996 out of 9,029, or 99.63 percent, were males and 33, or .37 percent, were females. Thirteen females were trapped on the night of July 5, when the maximum catch was made. The remainder, 20 females, were captured on six other nights.

During the flight period several nights were spent in an effort to observe feeding habits. Not a single beetle was seen eating, and thorough scouting during the day failed to reveal injury of any type to the surrounding foliage or grass. An examination of the adult mouth parts revealed that they were rudimentary and not fitted for chewing.

Control

The Station has received a number of requests for control recommendations. Lacking previous experience in the control of this insect, it was necessary to base suggestions upon the control measures for the Japanese beetle, Asiatic beetle, and Asiatic garden beetle. As the grubs of the *Ochrosidia borealis* are larger than the larvae of the three beetles mentioned, and the heavy infestations were located in contiguous areas, it was recommended that not less than 2 pounds of lead arsenate be used to 100 square feet of lawn area. The lawns treated in the fall of 1937 were visited during the spring and early summer of 1938. Excellent results were obtained at Byram Park, Greenwich, where the Park Department had made an application of lead arsenate equivalent to 3 pounds to 100 square feet. C. R. Neiswander, of the Ohio Agricultural Experiment Station, reports that he carried on tests by treating soil with one-half and one pound of lead arsenate to 100 square feet of area and also carbon bisulfide-rosin fish oil soap diluted in water. He favors the lead arsenate treatment. His results indicate that he obtained approximately 70 percent control with one pound of lead arsenate to 100 square feet of area. He checked his results one month after treatments made in September. It is definitely known that the residual effect of lead arsenate will last for three or more years depending upon the amount originally applied, soil types, and fertilizer used.

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RODENT CONTROL

(U. S. Biological Survey and Connecticut Agricultural Experiment Station Coöperating)

Robert Isaac

Mouse Control in Orchards

Serious damage to apple orchards by pine and meadow mice and the need for a more effective control for these rodents prompted this work and gave the coöperating agencies another chance to be of service to the agricultural industries of the State.

A new control method developed by the U.S. Biological Survey is being experimented with in the New England states. The Bureau recognized the need for further research and survey work to make this control more effective, and coöperating agencies have made the follow-up possible.

This Station has been interested in the rodent problem from the start. It has taken the study of the pine mouse as its particular research program because the pine mouse is more of a problem in Connecticut than in any other New England state.

Pine and Meadow Mouse Research Work in Connecticut

Three research problems were set up in Connecticut to aid in gathering necessary data on the pine and meadow mouse: (1) To determine the inter-relationship of pine and meadow mouse trail systems in the apple orchard habitat. This should yield valuable information on how to place toxic baits for more effectual control of pine mice. (2) To determine the drift and reinfestation rate of both pine and meadow mice. The data should give valuable information regarding the number of times an orchard area need be re-covered with toxic baits during the year in order to reduce to a minimum the population of tree-girdling mice. (3) To determine the percentage and kinds of food material eaten by the pine mouse in its orchard habitat. This should result in valuable data on possible bait materials and food habits of the pine mouse.

Investigation of the trail systems (1) was undertaken in an orchard near Norwich, Conn., where both pine and meadow mice were found under the same trees. Selecting 27 trees in one block, 6 dead-fall mouse traps were set under each tree. Traps were set in as many different places on the trails as was possible. Some were on the underground trails, some at windfall fruit, some on the surface trails, etc. Each trap site was numbered and marked. The traps were run as often as was necessary to trap out all the mice present. A complete record was taken of all that were caught.

Records were kept of the following: Date and time the traps were set and re-run; species caught; weight, sex and measurements of all mice; type of orchard floor cover; weather conditions; location of all traps in area; stomach contents of all pine mice; location of trail systems, nests and food caches.

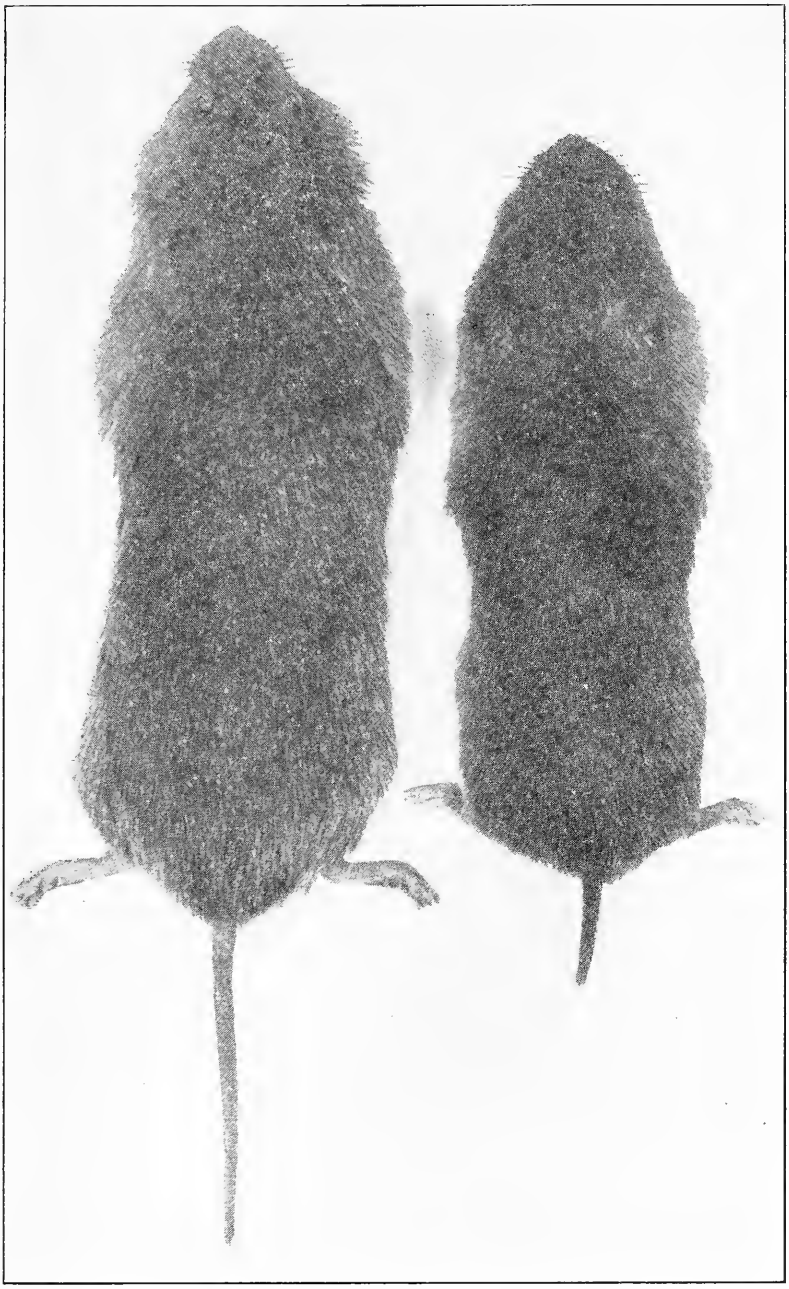

FIGURE 7. The two tree-damaging mice. Left, meadow mouse (*Microtus*). Right, pine mouse (*Pitymys*).

This work was completed and the data sent to the Control Methods Research Laboratory of the U.S. Biological Survey for analysis. It will be added to and correlated with the data collected by other men in this region. Our observations to date show that:

1. Pine and meadow mice were caught in the same surface trails.
2. Pine mice were caught as often on the surface trails as in their underground burrows.
3. In surface trails the meadow mice were usually caught first, followed by the pine mice.
4. The underground burrows of the pine mouse and the surface runways of the meadow mouse were one continuous system.
5. Burrows of the pine mouse, as a rule, came to the surface at a point near the extremities of the tree branches.
6. During this time (October) the pine mice were very active storing food in their underground food caches. Traps were often covered up by the dirt they were moving. This would have some effect on underground baiting at this time of year.

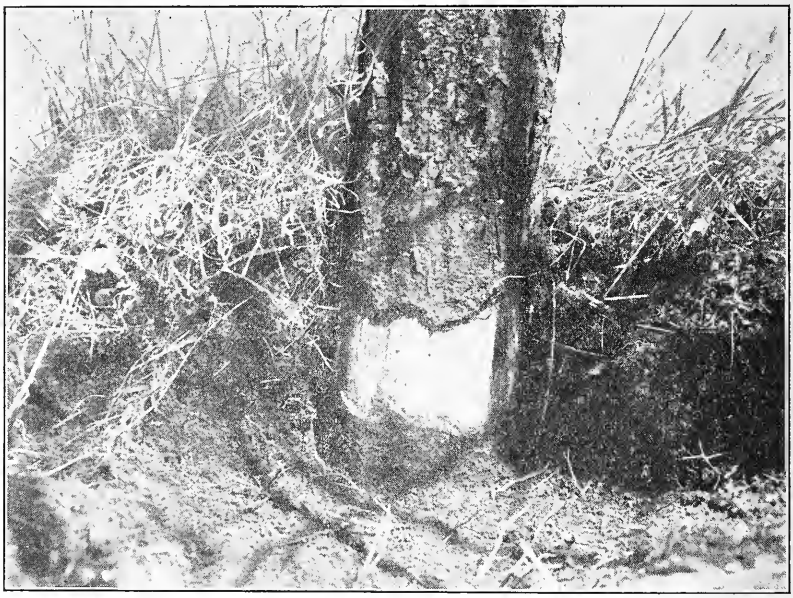

FIGURE 8. Result of mouse damage. Photographed second year after girdling.

It is planned to repeat the work.

Investigation of the drift of mice (2) was undertaken near Guilford, Conn., in an old unused pasture, adjacent to an orchard, where mouse populations are very high. An area has been cleaned of mice by trapping. This area has been surrounded by a barrier of traps to catch any mice

drifting into it. The trap sites are numbered and marked. The trap line is run at intervals during the month and all data recorded.

It is planned to run the test for a year to get a complete picture of the drift and reinfestation rates.

Data collected will include: Date and time traps are set and re-run; weight, sex, measurements of all species caught; type of cover; weather conditions; map of area; when heaviest drift occurs; why it occurs; sex drifting most; size of individuals drifting; etc.

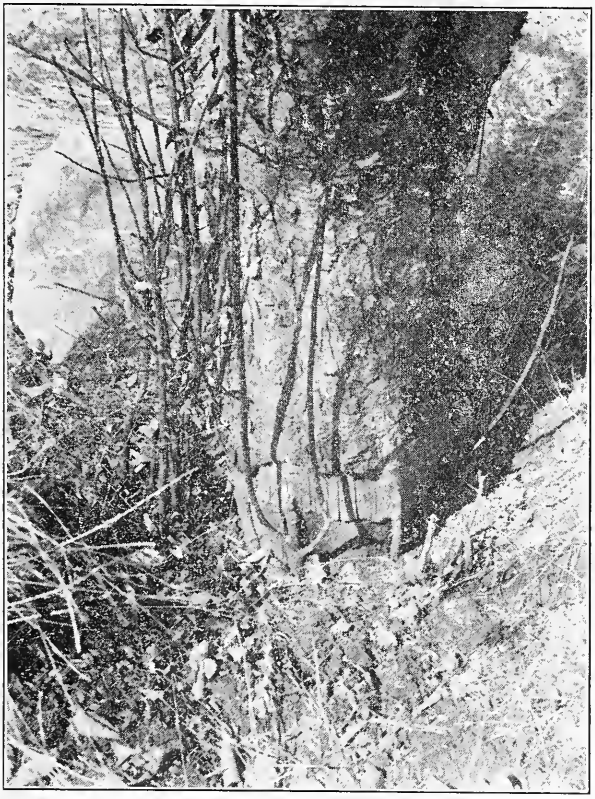

FIGURE 9. Apple tree girdled by meadow mice. Note consecutive years' damage.

This study was set up December 17, 1938, and so has not been under way long enough to draw any conclusions. A progress report has been made to the Control Methods Research Laboratory and to the Experiment Station.

The investigation of the food habits of pine mice (3) has been started only recently. Thirty stomachs will be taken from pine mice caught in the field each month and sent to the Food Habits Research Laboratories

of the Bureau of Biological Survey in Washington. Chewing habits of the mice make it difficult to determine stomach contents without check materials and use of a microscope. Therefore the stomachs will be analyzed with the aid of an index and herbarium collection being set up at the present time.

The index will consist of stomachs taken from one or two mice fed on a single food material under caged conditions. The food will be taken from the orchard floors and food caches found. After all available foods have been fed and stomachs taken that contain only one material each, they will be sent to the Laboratory to be used as an index in identifying food material in the stomachs of those mice caught in the field.

The herbarium collection will be made at the time the food material is collected and will accompany the stomach index as an additional help in identifying food in the stomachs of the mice.

The nature of this research problem makes it almost impossible to give any kind of a progress report. The collection of the stomachs, the feeding of the caged mice and the collection of the herbarium specimens is in progress, but until the work is complete stomach analyses will be impossible.

Survey Work

To date a survey has been made of 62 orchards representing approximately 150,000 trees.

Orchard records are kept of each orchard visited. These records show: Location of orchard, ownership, age of trees, amount of damage, type of cover and terrain, control methods used and any other important information obtainable.

Analysis of these surveys revealed:

1. Damage in every orchard visited.
2. Infestations of pine mice in every county in the State. (Entirely unrecognized up to this time.)
3. Approximately 20 percent of the apple trees in the State damaged to such an extent that they are no longer economically producing fruit.
4. Mulch and sod mean mice.
5. Pine mouse damage is more or less a new problem to the growers.
6. Orchards not in sod or mulch are free from meadow mice but can be infested with pine mice.
7. Orchards are reinfested from adjoining swamps, meadows and woodlands.
8. Pine mouse infestations are usually confined to one part of the orchard. Meadow mouse infestations occur over the entire orchard.
9. Each orchard has its individual control problem due to ground cover type, terrain, orchard practices, species of mouse present, etc.
10. The need for adequate control measures if the growers are to raise profitable crops.

These surveys are an important part of the program since they contribute valuable data for research work and are a source of individual help to the orchardist.

FIGURE 10. Apple tree girdled by pine mice below surface of the ground.

Operational Work

In order to make the new control method most effective and to reach the growers with the information we are gathering, it has been necessary to have some personal and group contact with them.

Through coöperation with the Extension Service, field demonstrations have been held each fall in every county of the State. The orchards of growers attending these demonstrations contain approximately 400,000 of the State's half-million apple trees. The field demonstrations were held to show the orchardists how to trailbait for the mice with the Biological Survey Rodenticide and to give them some idea of the life habits of the two rodents concerned.

To supplement these demonstrations the county agents allowed us time at their winter fruit meetings to discuss the mouse problem and to show a Biological Survey mouse control motion picture.

When personal visits are requested, every effort is made to call on the grower within 10 days after the request is made. To date more than 155 such calls have been made.

This operational work has been an important factor in making the control method very effective. Without this personal contact a great many failures to control mice would have resulted.

Other Rodent Problems Studied

Two other rodent problems have been under observation as a source of serious loss: (1) Mouse and rat damage to apples in cold and common storages; (2) mouse damage to conifers in nurseries, State Forests and on watersheds.

Both problems are widespread and are serious enough to warrant control measures. I have seen 500 bushels of apples in one storage destroyed by rats and mice and a great number of entirely unnecessary smaller losses in the State.

A special report has been made on "Mouse Damage to Conifers". This should be available for general distribution soon.

The destructive habits of the rats are well known so that very little need be said here. Suffice it to say that this is a problem with an unlimited field in research, control and education.

Woodchuck damage in orchards and to farm crops, rabbit damage in nurseries and young orchards, mole damage in nurseries, lawns, and gardens, deer damage to fruit trees, and, in a few cases, crow and sparrow damage, are all problems that need attention.

Much can be done to stop this loss from rodents and injurious mammals and birds, the losses that in many cases are the difference between profit and loss.

AN OUTBREAK OF THE ELM SPANWORM IN CONNECTICUT, 1938

G. H. Plumb and R. B. Friend

On June 9, 1938, it was reported to the State Entomologist that a large area of woodland in the town of Monroe was being defoliated by insects. Larvae received from the area were identified as those of the elm spanworm, or snow-white linden moth, *Ennomos subsignarius* Hübner. This is the first recorded outbreak of the spanworm in Connecticut, although major outbreaks have occurred in neighboring states.

Previous to about 1890 the insect was much more abundant than subsequently and was quite a serious pest of shade trees. At that time trees in the vicinity of New York City and Philadelphia were defoliated. A widespread infestation existed from 1907 to 1910 in the Catskill and Adirondack mountains, and there were extensive flights of moths in 1908 and 1909. About the middle of July, 1908, moths were very numerous about electric lights in New Haven, but disappeared after two days. According to information obtained from the U. S. Bureau of Entomology and Plant Quarantine, Division of Forest Insects, the last large outbreak of this insect in New England occurred in Massachusetts from 1914 to 1917.

The elm spanworm has but one generation a year. The larvae emerge from the light brown eggs, which are laid in masses on the bark of trees, at about the time foliage growth begins in the spring. Fully grown larvae are about two inches long and are brownish black with irregular, yellowish, rather obscure markings (Figure 11). The adults are pure white with a wingspread of approximately one and one-half inches. They lay their eggs about midsummer.

FIGURE 11. Fully grown larvae and pupa of the elm spanworm, *Ennomos subsignarius* Hübn.

On June 14 the Monroe area was visited for the purpose of determining the extent and degree of infestation and the types of trees affected. The brown, defoliated areas stood out noticeably against the green of the surrounding vegetation (Figure 12). There were two areas which showed stripping, both located in a low, swampy valley between high ridges, and separated by a highway. The larger area contained approximately 200 acres; the second, about 50.

At that time the caterpillars were just beginning to pupate and were spinning down from the trees in great numbers, although many were still actively feeding. The trees and brush were literally interwoven with stout strands of silk, and in a short time we were covered with both silk and larvae. Pupae were found in folded leaves or dangling loosely from twigs, and in masses of leaf fragments caught together with silk. Long skeins of matted leaf fragments were quite noticeable on trunks of trees, often stretching from the ground to high up on the trunk (Figure 13). The large quantity of leaf pieces lying about on the ground indicates that the larva is a very wasteful feeder. The pupal period lasted about 11 days, as adults were found in flight on June 25.

Several adults of the predatory carabid beetle, *Calosoma scrutator* Fabr., were seen, although none was feeding. A number of Ennomos pupae, collected at a later date and caged, yielded the following parasites: *Ephialtes conquisitor* Say; *Epiurus indagator* Cresson; *Chalcis* sp. and *Dibrachys boucheanus* Ratz., a hyperparasite of Ephialtes. Another collection of pupae carefully examined for evidences of parasites indicated a parasitism of about 69 percent. Many of these pupae contained a dipterous larva, probably belonging to the Tachinidae.

In order to determine the type of trees defoliated and the degree of defoliation, a plot 100 paces square was marked off. The plot was on moderately dry ground and contained 128 trees. Of these, red maple,

FIGURE 12. Trees defoliated by the elm spanworm.

white ash, and yellow birch were the predominant species, in the order named. White ash and red maple appeared to be the favored food plants. A total of 31 trees of the first species was defoliated; and of a total of 32 red maples, 29 were completely, and 3 partially, stripped. Yellow birch numbered 24 and on only 6 of these was stripping complete; 17 showed medium defoliation and one showed signs of only light feeding. Other species moderately to completely defoliated were: red oak, 8; cherry, 2; American elm, 8; American hornbeam, 4; hickory, 2; silver maple, one; hop hornbeam, one; sweet gum, one; sour gum, one; and pin oak, one. The only species showing no signs of feeding were tulip, 9, and sassafras, one.

A second count was made in a swampy area several hundred yards from the first plot. The number of trees totalled 104, and the predominant species here were red maple, 68, and American elm, 26. Other species included yellow birch, 3; shadbush, 2; butternut, 4; and winterberry, one. All of the trees in this general area were completely defoliated.

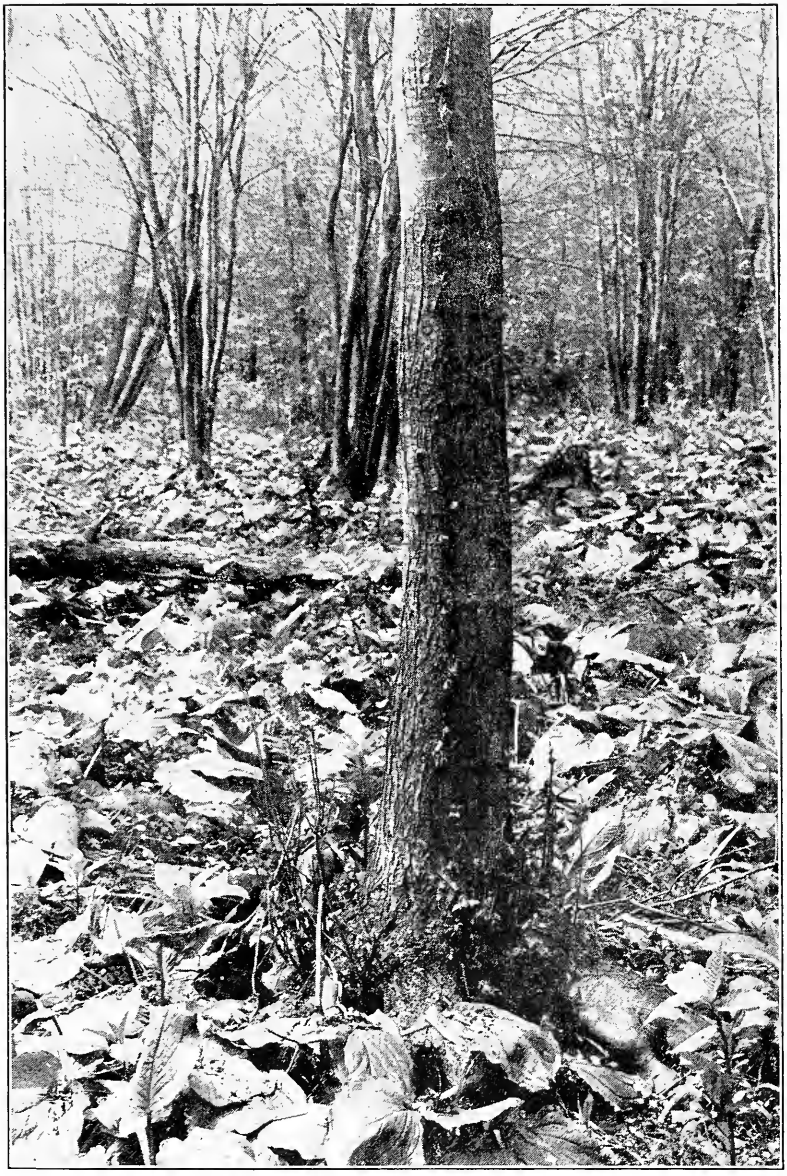

FIGURE 13. Trunk of tree, showing long skeins of matted leaf fragments.

It appears, then, that swamp lands containing a large percentage of red maple are particularly susceptible to attack by the elm spanworm when an outbreak occurs. The area previously mentioned at Middleboro, Mass., was of this type and was composed chiefly of white cedar and red maple, with a lesser amount of yellow birch. The red maple suffered defoliation of 90 to 100 percent; and birch, 60 to 65 percent. Complete stripping for two or three successive seasons resulted in the death of practically all of the red maple. Although a close examination was not made, most of the trees at Monroe were observed to have refoliated later in the season. However, a number of elms along the border of a 50-acre piece failed to put forth new leaves.

SOME AFTER EFFECTS OF THE HURRICANE

R. B. Friend

As an aftermath of the hurricane of last September certain insect problems may become acute. The windthrown trees, the logs cut from them, and the remaining standing trees may suffer severely from insect attack. Pine logs and down trees are very susceptible to borer attack, particularly by beetle larvae of the genera Monochamus and Callidium. Pine may also be attacked by bark beetles which carry blue-stain fungi, resulting in staining of the sapwood. Among hardwoods, ash and hickory are quite susceptible to borer attack. Ambrosia beetles attack all species until the wood dries out, boring small "pin-holes". Protection against these insects may be attained by placing the logs in ponds, or removing the bark, or sawing them into square-edged lumber. This should be done before warm weather sets in, about the middle of May. If sawn lumber has bark on the edges, it may be attacked by borers. If the logs are to be left in piles, these piles should be compact and not kept after midsummer.

Certain species of bark beetles breed in down trees and logs and may under some conditions attack surrounding healthy trees. Although attacks on standing pine by Ips bark beetles are not common in Connecticut, such attacks have occurred and if the beetles become abundant, growing trees may suffer. In parts of Connecticut the pales weevil is certain to become abundant in pine areas. This insect breeds in fresh pine stumps and logs, and the adults feed on the bark of young trees. Where cut-over pine land is to be replanted to pine, the earliest safe date to plant the young trees is 1941. Pine reproduction under about four feet in height may be severely injured on such areas.

One of the most pressing entomological problems concerns the abundance and distribution of the European elm bark beetle. This insect is the principal carrier of the Dutch elm disease and breeds extensively in windthrown elm trees and recently cut elm logs. At the present time the beetle is rare, if present at all, in eastern Connecticut, and the disease is not known to occur east of Branford and North Branford, the previously found infections in Old Lyme and Guilford having been eradicated to the

best of our knowledge. The large number of windthrown elms in the eastern part of the State may bring about an influx of elm bark beetles accompanied by an extension of the infected area into that region. All windthrown elm material should be utilized or destroyed before the coming summer.

Many trees which were not blown over suffered some root injury. There is a possibility that they will be susceptible to attack by certain cambium borers because of their weakened condition. Trees which have their roots loosened by the storm should be well braced and, during dry summer weather, well watered.

EFFECT OF SALT WATER SPRAY ON FOLIAGE

M. P. Zappe, J. P. Johnson and E. M. Stoddard

During the tropical hurricane which struck New England on September 21, 1938, a tremendous amount of plant damage other than breakage and uprooting was caused by high winds and salt water spray. Evergreens, particularly white pines, were injured seven or eight miles inland from Long Island Sound. Evergreen plantings around homes in the shore towns were more or less damaged, depending upon their exposure to salt spray. Near the shore many evergreens were actually flooded with salt water which in some places rose 15 to 20 feet above normal high tide. These appear to be dead. All the foliage turned brown and the trees may or may not start growth again in the spring of 1939.

In several cases deciduous trees that were completely defoliated started new growth late in the fall of 1938. This was noted in Noank, Conn., on Ailanthus trees and lilac bushes. The trees and shrubs grew in an exposed location and were not seen until several weeks after the storm, so we were unable to tell whether the leaves were damaged by salt spray or torn off by the force of the wind. We hope to make further observations on the effect of salt water spray during the spring and summer of 1939, to see what the final result will be. It is possible that many of the injured trees and shrubs will produce leaves and make a fair growth in 1939.

Many deciduous trees and shrubs, particularly maples, elms, roses and barberry, were severely injured. Most of the damage, of course, was on the windward side, which, during the storm, was the side facing the salt water.

We had an opportunity to make observations on the effect of salt water spray on many varieties of evergreens in a nursery at Waterford, about three-quarters of a mile from the shores of Long Island Sound. Observations on the following varieties of plants were made on October 13, 1938, about three weeks after the hurricane. Salt water spray damage was classified into one of the following grades:

None: where no visible damage was noted.

Slight: injury was noticeable but not serious and plants stood the injury fairly well.

Medium: where the damage was very evident and leaves were at least half burned.

Severe: where the salt spray burned the entire foliage or, in the case of deciduous plants, almost entirely defoliated them.

Observations were made on the following species and horticultural varieties of trees and shrubs:

CONIFEROUS TREES AND SHRUBS

Pinus cembra, Swiss stone pine	Medium
" *montana mughus*, mugho pine	Slight
" *nigra*, Austrian pine	Slight
" *resinosa*, red pine	Slight
" *rigida*, pitch pine	Slight to medium
" *strobus*, white pine	Severe
" *sylvestris*, Scotch pine	Severe
" *thunbergi*, Japanese black pine	Slight
Juniperus chinensis pfitzeriana, Pfitzer juniper	Severe
" *communis hibernica*, Irish juniper	Severe
" *excelsa stricta*, spiny Greek juniper	Slight to medium
" *horizontalis*, creeping juniper	None
" *virginiana*, red cedar	Medium
" " *glauca*, silver red cedar	Severe
" " *schotti*, Schott red cedar	Severe
Chamaecyparis oblusa nana, dwarf Hinoki cypress	None
" " *gracilis*, slender Hinoki cypress	None
" *pisifera filifera aurea*, golden thread cypress	Severe
" " *plumosa*, plume cypress	Severe
" " *squarrosa*, moss cypress	Severe
Cupressus macrocarpa crippsii, Cripps cypress	Medium
Picea excelsa, Norway spruce	Slight
" *polita*, tigertail spruce	Slight
" *pungens glauca*, blue Colorado spruce	Slight
" " " *kosteri*, Koster blue spruce	Slight
Tsuga canadensis, Canada hemlock	Severe (needles off)
" " *compacta*, dwarf Canada hemlock	Slight
" *caroliniana*, Carolina hemlock	Slight (tips injured)
Thuja occidentalis pyramidalis, American pyramidal arborvitae	Medium to severe
" " *globosa*, American globe argorvitae	Medium
" *orientalis aurea nana*, Berckmans golden arborvitae	Medium to severe
" *occidentalis* var.? Horticultural varieties of American arborvitae	Severe
Taxus cuspidata, Japanese yew	Tips killed, foliage not injured
" " *capitata*, upright Japanese yew	Severe
" " *nana*, dwarf Japanese yew	Slight
Abies balsamea, balsam fir	Medium to severe
" *concolor*, white fir	Medium to severe
Pseudotsuga douglasi, Douglas fir	Severe
Cryptomeria japonica, Cryptomeria	None

BROAD-LEAVED EVERGREEN SHRUBS

Azalea sp., several horticultural varieties	Severe (defoliated)
Buxus sp., boxwood	Leaves yellow (not burned)
Ilex crenata, Japanese holly	Severe
" *opaca*, American holly	Severe
Kalmia latifolia, mountain laurel	Severe

Pieris floribunda, mountain Andromeda	Severe
" *japonica*, Japanese Andromeda	Severe
Rhododendron maximum, rhododendron	Severe

DECIDUOUS TREES AND SHRUBS

Acer palmatum, Japanese maple	Severe (defoliated)
" " *atropurpureum*, Bloodleaf Japanese maple	Severe (defoliated)
Quercus palustris, Pin oak	Severe
Ulmus pumila, dwarf Asiatic elm	Severe
Azalea. Several horticultural varieties	Severe
Berberis thunbergi, Japanese barberry	Severe
Ligustrum ovalifolium, California privet	Medium
Rosa Rugosa, Rugosa rose	Severe

As a group the broad-leaved evergreens were more severely injured than some of the other evergreens. Deciduous trees and shrubs were also severely injured, in some cases being nearly defoliated. This may have been caused by the high wind rather than the effect of salt spray. Most of the pines were only slightly damaged, with the exception of white and Scotch pines. Needles of the former were severely browned even at considerable distances from salt water. Most of the species of *Juniperus* were seriously injured while the spruces did not show any great amount of injury.

MISCELLANEOUS INSECT NOTES

Damage by the Furniture Beetle. The furniture beetle (*Anobium punctatum* DeG.) has been found in the floors, trim and structural timbers of several houses in Connecticut. In July, 1938, the curator of the Israel Putnam Memorial Camp Museum discovered serious damage by this pest to museum furniture. Various wooden antiques such as spinning wheels, ox yokes, picture frames, tables and chairs had been badly injured. Beetles had also attacked the modern oak display cases used for books and documents. The legs of two spinning wheels had been completely ruined. An English authority has suggested the use of a mixture of 90 percent turpentine and 10 percent kerosene as a control measure. This mixture is painted on the infested furniture with a clean paint brush, with special attention to cracks and joints. It should be applied as long as the wood will absorb it. [Neely Turner]

Hexarthrum ulkei **Horn, in Buildings.** On March 9, 1938, a builder repairing a building in New Haven found much of the wooden trim in a finished basement badly damaged by insects. Investigation disclosed that the damage was of a powder-post type. A close examination of the infested wood showed an unusual type of injury. The painted surface was not damaged but the interior was reduced to a fine powder. The few exit holes were not as round as those of *Anobium punctatum* DeG. Living weevils found in the samples were identified by L. L. Buchanan as *Hexarthrum ulkei* Horn. The damage to this building was so serious that all of the basement cabinets, baseboards and door casings were replaced. On April 12, another infestation of *Hexarthrum ulkei* was found in basement stairs in a house in East Haven. The wood was also infested by *Xestobium rufovillosum* DeG. In August, 1938, further weevil damage was found in the sheathing of a house in New Haven. The sheathing was on the lower part of the house and was also infested by termites.

[Neely Turner and M. P. Zappe]

Hayfield Damaged by Asiatic Beetle, *Anomala orientalis* Waterh. In the early spring of 1938, our attention was called to a hayfield, about five acres in extent, on Farnham Avenue, in the Westville section of New Haven, which was severely damaged by white grubs. Between two and three acres of turf had been destroyed. The grubs were feeding heavily, and many smaller areas were injured throughout the field. Diggings yielded between 20 and 35 grubs to a square foot in many sections of the field. The grubs were identified as those of the Asiatic beetle, *Anomala orientalis* Waterhouse.

As the owner did not want to use lead arsenate to control the grubs because he desired to use the field for farm crops, it was recommended that the field be given a deep and very thorough discing to kill the insects when the majority were in the prepupal and pupal stages. If necessary, the field could be disced two or three times at intervals of several days to obtain a high mortality. It was further recommended that the field should lie fallow until the following year to prevent additional reinfestation.

FIGURE 14. Hayfield with the grass injured by the Asiatic beetle, *Anomala orientalis* Waterh.

The Asiatic beetle was first found in Connecticut during 1920, and this is the first record we have of damage to hayfields or pastures. The larvae have in the past confined their activity to lawn turf and, on rare occasions, to heavily planted perennial beds. [J. P. JOHNSON]

Notes on the Asiatic Garden Beetle, *Autoserica castanea* Arrow. One dead adult specimen of the Asiatic garden beetle was found in New Haven in the summer of 1928. Since that year the insect has been recorded from many other sections of the State. These records have been published in the Annual Reports of the State Entomologist. During the last two

years the Asiatic garden beetle has become much more prevalent in Greenwich, Stamford, Westport, Bridgeport, and New Haven. Severe damage to lawns caused by the grubs of these beetles feeding upon the grass roots has occurred in all of these towns. Adult beetle feeding upon foliage of vegetable and flowering plants increased in 1938 over that of previous years. This was indicated by more requests for information pertaining to control measures and by our observations in the field.

The adults can be controlled by spraying the foliage with lead arsenate, five ounces in five gallons of water, plus three and one-half ounces of flour. The lawns should be treated with lead arsenate, one pound to 100 square feet of area, to control the grubs.

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[J. P. JOHNSON]

Notes on the Hairy Chinch Bug, *Blissus hirtus* Montandon. The month of May, 1938, was cold and wet and it was expected that these conditions would have a detrimental effect upon the hairy chinch bug. It was found, however, that the infestations in New Haven carrying over from 1937 were just as troublesome and injurious to the lawns as in that year. The first generation of this insect caused considerable damage to lawns in Bridgeport, Hamden, Hartford, New Haven, Shelton and Westport, and was reported from several other towns. The second generation was also reported from these towns, and through field observations it was noted that the infestations had caused more injury and the insects were more numerous than earlier in the season.

Control: Tobacco dust containing one percent nicotine, or cubé dust containing one percent rotenone should be applied at the rate of 25 pounds to 1,000 square feet of lawn area.

Treat the first brood, preferably in the younger nymphal stages, about the first week of June. If a very heavy infestation exists, make a second application the following week. Treat the second brood about August 10, and if a second application is necessary, make it about August 20. As the hairy chinch bug is difficult to control satisfactorily, examinations should be made to determine the growth stage of the insect so the insecticide may be applied at the best time.

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[J. P. JOHNSON]

The European Earwig in Connecticut. On June 22, 1938, Doctor Britton collected a nymph of the European earwig, *Forficula auricularia* Linn., in the blossom of a climbing rose from a garden in Westville. A day later, after the specimen had been identified, the yard was examined without finding any more specimens, but on October 19, Mr. Zappe found an adult male in the same yard.

As far as we know these are the first records of the occurrence of this insect in Connecticut. The European earwig has been found in shipments

of imported nursery stock and bulbs from Europe. The first large colony of this insect discovered in the United States was at Newport, R. I., in 1911. It was found on the Pacific Coast in 1916 and later reported in Idaho and in western New York. The earwigs belong to the Order Dermaptera, and are so closely related to the Orthoptera that they were formerly included as a family of that order. In the localities where the European earwig has been introduced, the insect has increased rapidly and occurred in great numbers. It is said that they will feed upon almost anything that can be considered edible. They work chiefly at night and are especially objectionable due to the fact that they swarm into houses, where they crawl into every conceivable place to hide. The chief methods of control are the use of traps and a poisoned bait such as is used against cutworms and grasshoppers. [B. H. WALDEN]

Control of Rose Chafers on Peaches. A complaint was received during June from Mr. Benjamin Shiffrin, who stated that rose chafers, *Macrodactylus subspinosus*, were troublesome in his orchard on the Boston Post Road near Milford, Conn. The beetles were eating into the young peaches and were numerous enough to cause the owner considerable anxiety. In view of the general lack of information concerning positive controls for this insect, sprays were applied, using our own power outfit and two different mixtures. On one portion of the orchard we used 2 pounds lead arsenate, 4 pounds zinc sulfate, 6 pounds lime and 10 pounds flotation sulfur paste in 100 gallons. On the second portion we used 10 pounds cubé powder in 100 gallons, with skim milk spreader. This was on June 16.

Examination the following week gave the results below.

Sprayed with lead arsenate, etc.	no beetles on 50 trees
Sprayed with cubé	8 beetles on 22 trees
No spray	70 beetles on 50 trees

While this experiment was made towards the end of the rose chafer season of damage, it shows that the lead arsenate-zinc sulfate mixtures commonly recommended for curculio control have a marked effect on the rose chafer.

An attempt was also made to control rose chafers in a private garden near Mount Carmel where they were abundant. In this case we used 2 pounds cubé powder and 1 pound pyrethrum powder in 100 gallons, covering an area roughly of 30 feet square. Examination a few days after the application was made indicated only partial control and beetles were still numerous in the treated area. [PHILIP GARMAN]

Results of Trapping Rose Chafers. During the past few years, when the Japanese beetle traps were placed in the field early in June, it was noticed that a considerable number of rose chafers, *Macrodactylus subspinosus* Fabr., were captured. Four traps were placed in Waterbury and two in New Haven where the rose chafers had been very numerous the preceding year. The traps were visited periodically by L. A. Devaux, and the captures recorded. The totals for each locality are given in the following table.

Locality	Date	Number of chafers
Waterbury	June 7	98
	" 8	67
	" 10	105
	" 14	496
	" 15	140
	" 16	251
	" 17	96
	" 20	313
	" 21	109
	" 26	225
	" 27	142
Total		2,042
New Haven	June 8	57
	" 17	455
	" 24	245
	July 11	184
Total		941

The traps did not catch all the rose chafers, as many were seen in the immediate vicinity. If traps are used to reduce a heavy infestation, it is recommended that they be placed several feet away from favorite host plants to avoid excessive feeding on the foliage or flowers.

[J. P. Johnson]

The Forest Caterpillar, *Malacosoma disstria* **Hübner.** During May and June the forest caterpillar was locally very abundant in northwestern Connecticut. In Torrington, Litchfield, Goshen and Cornwall sugar maples in many places were completely defoliated, many oaks also suffered partial to complete defoliation, and other hardwood trees were more or less affected. It is characteristic of this insect to fluctuate markedly in abundance in any one region, and during the last five years local outbreaks have occurred in parts of the State. In 1934 oaks and maples were defoliated in Meriden. In 1935 the caterpillar was more prevalent than in 1934, particularly in the northwestern part of Connecticut where it was observed on sugar maple and elm. A further increase in numbers was noted in 1936 in northern Connecticut, from Thompsonville west. Sugar maples and linden were reported attacked. In 1937 the insect was abundant, but apparently less so than in 1936. It became very injurious in 1938, as noted above.

An outbreak of the forest caterpillar has been present during the last few years in northeastern United States west to Minnesota and in southern Canada. This general outbreak reached a peak in 1936 and now appears to be declining, so a decrease in the abundance of the insect in Connecticut is expected in the near future.

The life cycle of the insect is similar to that of the eastern tent caterpillar, a closely related species which feeds on fruit trees and wild cherry. Both insects are discussed in Bulletin 378 of this Station.

[Roger B. Friend]

FIGURE 15. Forest caterpillars clustered on tree trunk.

The European Pine Shoot Moth, *Rhyacionia buoliana* **Schiff.** The control of the European pine shoot moth in forest plantations of red pine in Connecticut has been carried on since 1933 by Federal relief agencies and, through an arrangement with Mr. A. F. Hawes, State Forester, by the Civilian Conservation Corps. The former have concentrated their efforts in the southern part of the State and the latter worked over much of the State the first two or three years but is now largely confining its efforts to the northern part. The control operations have been aimed at reducing the abundance of the insect so that the plantations could reach a stage of development after which the stands would no longer be seriously affected, for the shoot moth is primarily a pest of young trees.

FIGURE 16. Large sugar maples defoliated by the forest caterpillar.

Cold winter weather, particularly sub-zero temperature, kills a large proportion of the hibernating larvae, and this is believed to limit the abundance of the insect in northern Connecticut where heavily infested plantations are rare. Mr. DeCaprio of the Station staff inspects red pine stands each winter in the northern part of the State with the aid of men from the CCC camps, and determines whether or not the intensity of the infestation in any one stand warrants control measures the subsequent spring. The extent of control operations to be undertaken thus depends on this inspection. This system has been in effect for three years, and no serious outbreaks have developed.

In the southern part of the State conditions are more favorable to the insect and extensive control operations have been undertaken by Federal relief agencies. The work started in 1933 and has continued to date. Due to the general intense infestation existing in this region, many

stands have been treated by control crews more than once. In the period from October 1, 1937, to June 13, 1938, the crews, under the supervision of Mr. McCartney of the WPA office, worked 426 plantations, totaling 3,295 acres, in Fairfield, Hartford, Litchfield, New Haven, Middlesex and New London counties, and 6,478,112 infested tips were removed from the trees and destroyed. The following table, from Mr. McCartney's report, summarizes the extent of control operations for the period. In some cases the crews removed tips from ornamental pines close to forest

Table 31. Pine Shoot Moth Control

County	Plantations worked	Total acres worked	No. tips removed	No. tips removed per acre
Fairfield	259	988	3,288,191	3,321
Hartford	10	206	47,094	229
Litchfield	2	39	10,200	262
Middlesex	42	255	276,577	1,085
New Haven	97	1,725	2,804,913	1,046
New London	16	82	51,137	624
Total	426	3,295	6,478,112	

plantations. The figures are included in the table. Although the data on infested tips removed are an estimate, hence approximate, nevertheless it does indicate the intensity of the infestation in the region to a certain extent. Only infested plantations were worked, hence the data indicate a relatively heavier infestation outside of Fairfield County, as compared to conditions in that county, than actually exists. About 3 times as many infested tips per acre were removed from trees in Fairfield as in Middlesex and New Haven, about 5 times as many as in New London, about 13 times as many as in Litchfield, and about 15 times as many as in Hartford. The general picture of the relative intensity of the infestation in the respective counties given by the data is supported by field observations. This control work is being continued during the 1938-39 season.

[Roger B. Friend]

FINANCIAL STATEMENT

Insect Pest Appropriation

July 1, 1937—June 30, 1938

RECEIPTS

Insect Pest Appropriation		$48,910.00	
Connecticut Pomological Society		400.00	
Receipts from nurserymen (penalty for failure to register)		45.00	
Miscellaneous receipts:			
Mileage for use of automobile	$2.80		
Sale of anabasine	2.00	4.80	$49,359.80

DISBURSEMENTS

Salaries	$37,656.25	
Labor	4,039.54	
Stationery and office supplies	96.39	
Scientific supplies (chemicals and laboratory supplies)	109.42	
Scientific supplies (spraying and dusting materials)	289.51	
Scientific supplies (photographic supplies)	52.07	
Miscellaneous supplies	157.65	
Automobile oil	24.08	
Telegraph and telephone	246.71	
Postage	141.75	
Travel (outlying investigations)	2,697.50	
Travel (meetings, conferences, etc.)	187.18	
Travel (gasoline for automobiles)	542.52	
Transportation of things (freight, express and parcel post)	12.72	
Publications (reprints, etc.)	5.00	
Storage of apples	81.24	
Gas and electricity	243.84	
Water	73.41	
Insurance (automobile)	132.66	
Miscellaneous contingent expense	25.25	
Furniture, furnishings and fixtures (purchases)	107.81	
Furniture, furnishings and fixtures (repairs)	6.00	
Library (books and periodicals)	225.22	
Scientific equipment (purchases)	134.79	
Scientific equipment (repairs)	38.59	
Automobile (purchases)	578.00	
Automobile (repairs)	270.45	
Tools, machinery and appliances (purchases)	87.85	
Tools, machinery and appliances (repairs)	20.51	
Buildings (repairs and alterations)	7.28	
Total disbursements		48,291.19
Balance on hand June 30, 1938		1,068.61*
		$49,359.80

*Reverted to State Treasury.

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SUMMARY OF OFFICE AND INSPECTION WORK

Insects received for identification	1,136
Nurseries inspected	424
Regular nursery certificates granted (402 nurseries)	424
Duplicate nursery certificates for filing in other states	150
Miscellaneous certificates and special permits granted	185
Nursery dealers' permits issued	94
Shippers' permits issued to nurserymen in other states	243
Blister rust control area permits issued	240
Certification and inspection of occasional shipments	
Parcels of nursery stock	1,019
Corn borer certificates	961
Packages of shelled corn and other seeds	2,217
Japanese beetle certificates	
Nursery and floral stock and farm products	56,964
Soil, sand and manure	37
Orchards, gardens, fields and lawns examined	159
Buildings examined for termites	93

Shipments of imported nursery stock inspected	13
Number of cases	51
Number of plants	385,000
Apiaries inspected	1,609
Colonies inspected	10,705
Apiaries infested with American foul brood	121
Colonies infested with American foul brood	199
Towns covered by gypsy moth scouts	93
Infestations discovered	445
Egg-clusters creosoted	362,118
Larvae and pupae killed by hand	1,331,388
Infestations sprayed	58
Lead arsenate used (pounds)	142,523
Miles of roadside scouted	1,702
Acres of woodland scouted	345,912
Letters written	5,020
Circular letters issued	1,095
Bulletins and circulars mailed	6,718
Packages sent by mail and express	67
Post cards mailed	283
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Photographs illustrating articles in this bulletin were taken by Mr. B. H. Walden.

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